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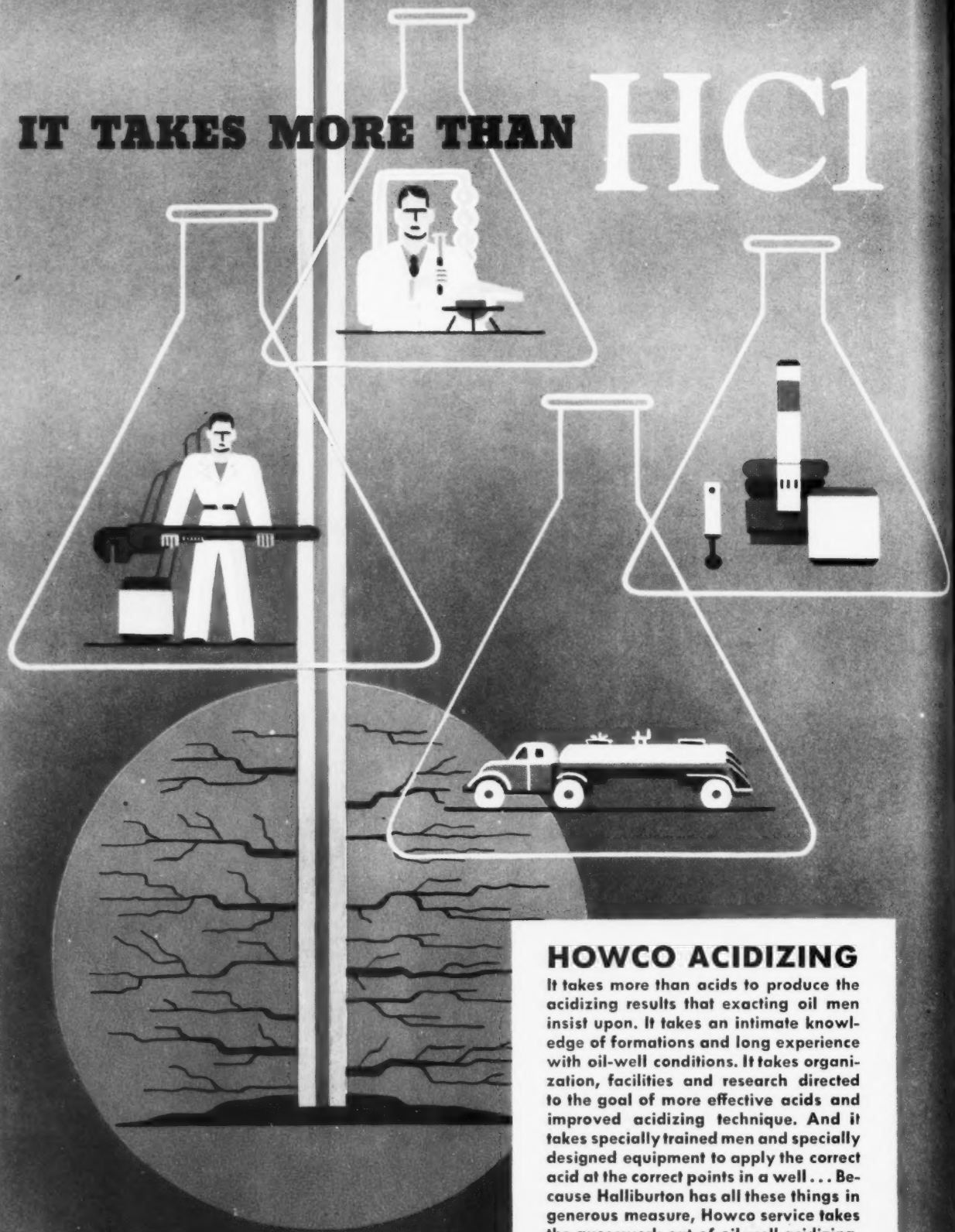

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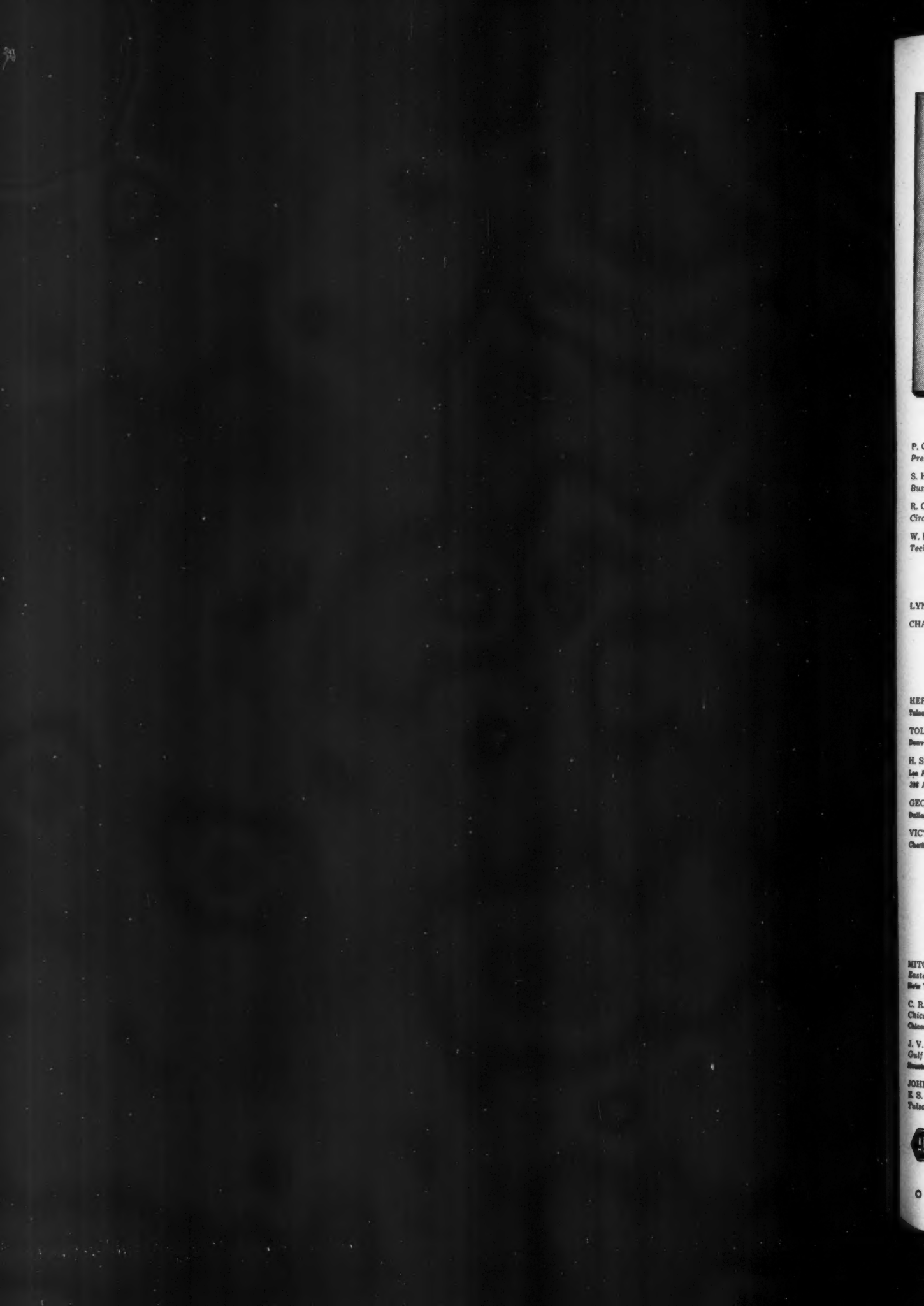

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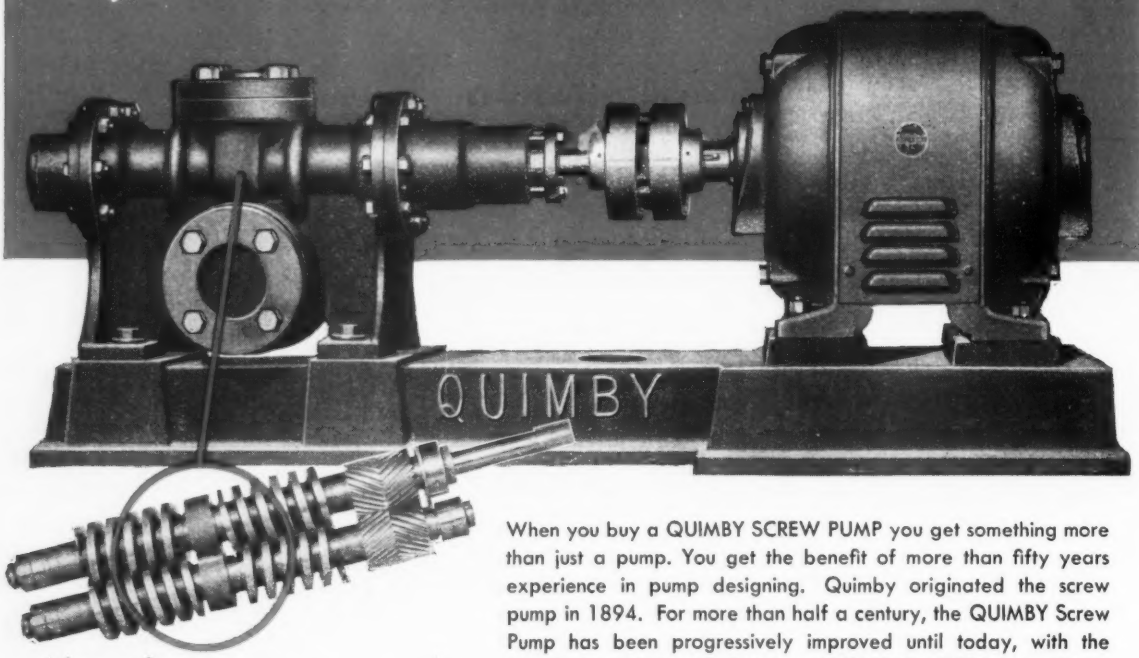

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The Matter of Lead

PROBABLY no projectors of things to come of a year or more ago envisioned a shortage of lead as being of major significance in postwar petroleum operations. But it became just that starting last spring, and the conditions resulting are daily more critical to many refiners and distributors.

Most readers are familiar with what has happened in recent months. Total lead supplies for this year are estimated to be 25 per cent under the 1-million-ton demand. Lead requirements for the manufacture of tetraethyl lead for use in improving the antiknock properties of motor fuel in this country are approximately 6,000 tons monthly. The Ethyl Corp. has been able to purchase and manufacture only a small fraction of this monthly demand. A recent report revealed that in August the company's purchases were less than half the CPA allocation of 4,000 tons. The concern's inventories have been reduced to less than a half-month's actual requirements.

The now critical situation was explained to government officials early in the year by representatives of the oil industry and the Ethyl Corp. The fact was stressed that the lead requirements in the manufacture of superior motor fuels are only a small fraction of the total lead output, and furthermore a substantial curtailment in supply for use in manufacturing an antiknock blending component would be of direct concern to the owners of more than 30 million motor vehicles and other users of internal-combustion power. The same situation applies to Canada and many other countries.

Tetraethyl lead over a period of years has become the common denominator of motor-fuel quality. Refiners with varying types of charging stocks and processing equipment, through the use of ethyl fluid, have been able to meet the commonly accepted gasoline specifications. This operating condition in turn has enabled car manufacturers and others to design engines with the assurance that motor fuels giving uniform and satisfactory performance would be available everywhere.

This uniformity in antiknock characteristics is now being threatened despite official reductions in antiknock ratings. Gasoline minus ethyl fluid will vary in quality so that the difference will be apparent in engine performance and over-all efficiency. Some refiners because of war-product installations are in a better position than others in processing gasoline of high antiknock ratings. But materials and manpower are not available quickly to end this discrepancy in quality between plants, based on processing arts. The economics of refining generally favor the use of ethyl fluid.

Thus the real issue in this matter of a lead shortage in gasoline blending is one of waste in utilization as well as in manufacture. Conservation and the operating position of an important segment of the oil industry demand that adequate relief be granted at Washington promptly.

L.P.G. Consumers Hit by U. S. Order to Surrender Tank Cars

by Henry D. Ralph

WASHINGTON.—Curtailment of distribution of liquefied petroleum gas this winter is a certainty as a result of the action of the Office of War Mobilization and Reconversion last week in requiring shippers of butane and propane to surrender high-pressure tank cars which they have used for this service during the war.

This is the second reversal of OWMR's position on pressure tank cars. During the war the Government ordered L.P.G. distributors to serve various war housing projects but did not permit them to purchase new tank cars. Instead the Government built 483 propane cars and leased them to L.P.G. companies. Last August OWMR directed the War Assets Administration to sell 45 of these cars immediately, and the remainder over a period of months, to companies operating government ammunition plants for the manufacture of liquid ammonia in the production of fertilizer to be shipped by the Army to increase food production in Germany and Japan.

On protest of L.P.G. shippers OWMR, on September 25, instructed the leasors of these 45 cars to keep them in L.P.G. service in spite of their sale by WAA. However, on October 4, Director John R. Steelman again ordered the cars surrendered. R. C. Jopling, Washington, Phillips Petroleum Co. vice president, wired Steelman:

"Our letters to you protested the transfer of government-owned propane cars, which were purchased for our service, to the fertilizer program, and also asked for your support of our application for an urgency certificate to purchase 199 cars. We also asked you for a hearing. Our reason for directing our appeal to you was that we had been informed by CPA that they had issued an urgency certificate for 45 cars to Commercial Solvents Co. upon direct instructions from your office.

"Instead of assisting us in securing our urgency certificate as you did Commercial Solvents, you ordered WAA to sell no more propane cars to Phillips Petroleum Co. or anyone else. Instead of granting us a hearing you have ignored our request.

"Your action in taking these cars away from Phillips Petroleum Co. and other liquid gas shippers means that thousands of families, many of them GI's, will be without fuel this winter. We are now faced with the responsibility of notifying them of our inability to serve them. We must also reply to more than 2,000 letters which we have received within the past two weeks from distributors, consumers, congressmen, and senators.

"We want to be fair in what we tell them. Will you please explain to us why you considered the fertilizer supply to aid crops of future years for the Japs and Germans more important and more urgent at this time than the fuel needs of thousands of American families this winter. We conscientiously feel that you have made a grave error in not postponing at least a small portion of the fertilizer program for only 4 months until the emergency in the liquefied-gas industry has passed. Your entire fertilizer program, we understand, will require some 3,000 cars. We are only asking to keep 19."

Comments on the L.P.G. tank car situation are included in Watching Washington, page 68.

Optimism as to Future Markets Keynotes A.G.A.'s Atlantic City Meeting

ATLANTIC CITY, N. J.—With a registration of 10,000, the American Gas Association's twenty-eighth annual convention and exhibition—its first full-dress postwar meeting—opened and closed on optimistic notes, viewing the opportunities that expanding markets offer the industry.

This optimism found solid sustenance in the association's first report on proved gas reserves in the United States. Making its report, the new-reserves committee found that, on a conservative basis, reserves total nearly 148 trillion cubic feet, of which 89.5 per cent, or a little over 132 trillion cubic feet, is located in five states, Texas leading with over 78 trillion cubic feet, followed by Louisiana nearly 20 trillion cubic feet, Kansas over 13 trillion cubic feet, California nearly 11 trillion cubic feet, and Oklahoma a little over 10 trillion cubic feet.

A natural-gas man, R. H. Hargrove, vice president of United Gas Pipe Line Co., Shreveport, was elected new president of the association. The new first vice president is Hudson W. Reed, Philadelphia Gas Works Co., while Robert W. Hendee, president of Colorado Interstate Gas Co., Colorado Springs, also a natural-gas man, was elected second vice president. Among those elected to 2-year terms as directors were F. M. Banks, vice president of Southern California Gas Co., Los Angeles; D. P. Hartson, vice president, Equitable Gas Co., Pittsburgh, and Frank C. Smith, president, Houston Natural Gas Corp.

Better conservation of natural gas through research, industry effort, and state legislation was urged by Secretary of the Interior J. A. Krug in an address at the A.G.A. meeting.

"The industry can redouble its conservation activity," he said. "There is no man in this room today who can justify the wastage of natural gas which is lost in connection with petroleum production. The loss of 680,000,000,000 cu. ft. of natural gas in 1943 is hard cash money out of your pocket more than out of mine, although in the end it is out of mine and out of every citizen's."

Among the highlights of the address of Hargrove, the new president, were references to the natural-gas research program, in which studies and progress are being made on pipeline hydrates, gas-well deliveries, flow in high Reynolds-number pipe lines, storage of natural gas and hydrate, nitrogen removal. He also stated that in addition to the 1,200-mile gas line from Texas to California, other pipe-line projects approved and under way involve an additional 2,640 miles at a cost of $120,000,000.

The activities of the Federal Power Commission were discussed, and Charles I. Francis, well-known Houston attorney and authority on oil and gas laws, presented 12 points for consideration as to possible amendments to the natural-gas act. Francis stated that the trend in interpretation of the present law both by FPC and the courts was far beyond what the industry had thought the law was intended to cover.

Discussing the outlook for liquefied petroleum gas, particularly to those interested in using it to enrich other gas distributed to consumers, George R. Benz, manager, chemical-products department, Phillips Petroleum Co., assured them there would be an ample supply for some years to come.

Active at the A. S. M. E. Petroleum Mechanical Engineering Conference: W. Fred Stewart, Spartan Aircraft Co., Tulsa; William Raisch, construction engineer, New York City; D. Robert Yarnall, president of the A. S. M. E. and president of Yarnall-Waring Co., Philadelphia; Orval Lewis, Jones & Laughlin Supply Co., Tulsa

Petroleum Mechanical Engineering Feature at A.S.M.E. Meeting

by R. B. Tuttle

THE 1946 national conference on "Petroleum Mechanical Engineering" of the American Society of Mechanical Engineers started in Tulsa October 7, with the 3-day sessions covering, horizontally, all the major divisions of the petroleum industry. The program was keyed for an attendance of over 400 members and guests from all parts of the country.

The 18 technical meetings included 37 papers dealing with new developments and improved technological processes in oil and gas production, pipe lines, refining, construction materials, and equipment manufacture and product applications. The engineering society with its membership in every state and other countries, had literally unlimited opportunities to construct a comprehensive program from the membership of 20,443, and the technical presentations showed that full advantage was taken of them.

Opening the program with a luncheon jointly attended by the members of the Engineers Club of Tulsa. D. Robert Yarnall, president of the A.S.M.E., spoke on "Engineers and Human Affairs." Dealing with the young and embryonic engineers starting in industry, and the pressure in some areas on them to join with representative bargaining groups undertaking to organize engineers, Yarnell said, "Let us bear in mind, however, that engineers in the middle-age and older groups are very largely executives and managers and chief engineers and in most cases they are responsible for the employment (among others) of younger engineers. They look upon the young men as the potential from which the next generation of managers and executives may come. The younger men are encouraged to join our engineering societies and to write and discuss technical papers." Yet, in speaking of the future, he continued, "If a young man joins a white-collar union representing engineers and draftsmen, how will the transition period from this classification as a union member and his classification as an executive or manager be made?"

Digests of papers at this meeting appear in a special section of this issue, starting on page 88.

Following the first day's series of meetings, a smoker and buffet dinner, with entertainment, was held. Principal speech was the address prepared for the evening banquet the second day of the meeting, with Sen. E. H. Moore (Oklahoma) paying tribute to United States mechanical development as conducted under the system of free enterprise. However, he asserted, "Business, from the smallest unit to the largest industrial enterprise, is falling victim to the tyranny of an uncontrolled bureaucracy."

Orval Lewis, Jones & Laughlin Supply Co., Tulsa, was the A.S.M.E. presiding officer at the banquet, and R. J. S. Pigott, Gulf Research & Development Co., Pittsburgh, was toastmaster.

A.I.M.E. Fall Meeting Attracts 400 Engineers

by E. H. Short, Jr.

GALVESTON. — Derricks, together with draw works and other equipment, have been skidded quite often to new locations, and this equipment is also moved intact on barges through almost inaccessible swamp country along the coast; but when J. H. Bowman, Creole Petroleum Corp. calmly mentioned, at the A.I.M.E. meeting held here last week, that derrick, draw works and all, are picked up bodily by marine cranes and moved to another location in Lake Maracaibo operations, a general stir of surprised interest was created during the closing session.

The fall meeting of the A.I.M.E. Petroleum Division held here October 3-4-5 attracted over 400 members and guests from all parts of the country. Frequently heard in the informal gatherings outside the session room were expressions to the effect that this particular meeting was perhaps one of the most interesting sessions ever held. There was a general appreciation of the fact that the topics prepared for the session were all of a practical nature.

The subject of "Marine Drilling in Venezuela," by James A. Clark, Creole Petroleum Corp., was discussed (in the absence of Clark) by J. H. Bowman of the same company who also showed moving pictures of piling construction and placement in Lake Maracaibo.

In an earlier session Paul Weaver, Gulf Oil Corp., Houston, discussed a paper entitled "A Review of Geophysical Prospecting Methods, Devices, and Procedures" which he prepared jointly with C. H. Dresbach, Western Gulf Oil Co., Los Angeles.

In recent months a great deal of attention has been focused on the oil possibilities in the Gulf of Mexico and also in the area of the Bahamas by almost all major operators, and this part of Weaver's discussion in particular, was received with considerable interest. Weaver reviewed the destructive effect of open Gulf water on a piling location in 14 ft. of water only a mile and a half off shore and challenged the petroleum engineer to devise methods of drilling salt-dome locations which probably exist some 20 miles off shore.

The Galveston meeting was arranged by the Gulf Coast Section of the A.I.M.E. Officers of the section are: Mercer R. Parks, chairman; H. King Hubbert, vice chairman; F. B. Plummer, vice chairman; A. B. Stevens, vice chairman; George L. Nye, secretary-treasurer.

(Digests of papers at this meeting were published in last week's issue.)

Sydney S. Smith, Col. C. H. Chorpening, and E. I. Hanlon, with the Medal for Merit Smith received this week in recognition of his work in designing and developing the portable military pipe line

Sydney S. Smith Presented High U. S. Award for Army Pipe Line

RECOGNITION was given early this week to the work of Sydney S. Smith, products pipe-line department manager of Shell Oil Co., Inc., in designing and developing the portable military pipe lines—one of the oil industry's major contributions to the war effort.

At a dinner in Tulsa, Smith was formally presented the Medal for Merit, regarded as the highest award for citizen service in World War II. The presentation was made by Col. C. H. Chorpening, in charge of the U. S. District Army Engineers in Tulsa. The affair was sponsored by E. I. Hanlon, M. F. Waters, D. E. Buchanan, John H. Boyle, and other friends of Smith, some of whom were connected with the manufacture of part of the portable pipe-line equipment.

The citation accompanying the award carried the signature of President Truman. It read:

"Sydney S. Smith, for exceptionally meritorious conduct in the performance of outstanding services to the United States. Mr. Smith, following the outbreak of World War II, foresaw the entry of our country into the conflict and started to promote portable military pipe lines to keep mobile armies supplied with petroleum products. Actuated by high patriotic motives, he unstintingly gave his time and his experience in assisting the Government in designing, perfecting, and proving such equipment. He conceived and developed the ingenious automatic controls vital to the proper operation of pipe-line systems and permitted the Government to use them on a royalty-free basis. His was an outstanding contribution to the victorious conclusion of the war by the Allies."

The portable pipe lines, so light a joint could be carried by one man, fed motor fuel to front-line troops at a rate of 6,000 bbl. daily. They were first used in the North African campaign, later were an outstanding success in the China-Burma-India Theater, and finally followed the advance of allied troops through France and Germany after D-Day.

Besides breaking through much government red tape in promoting the portable lines, Smith designed the automatic controls which allowed adjacent units to compensate for the failure of a pumping unit on the line. Hanlon-Waters Co. in Tulsa manufactured the automatic controls as well as parts of other equipment for the lines. Subcontractors under Hanlon-Waters included Gaso Pump & Burner Manufacturing Co., Frank Wheatley Pump & Valve Manufacturers, and Moorlane Co.

Smith was educated at Marietta College, Marietta, Ohio, where he received a degree in 1915 with a major in physics and mathematics. After his graduation, he went to Burning Springs, W. Va., where, with his father he built and operated one of the first compressed-air plants for recovering oil from the depleted leases of the region.

He attended officers' training camp in World War I, and after a period of designing, building, and operating natural-gasoline plants in Oklahoma, he became associated with the old Roxana Oil Co., later a part of Shell. He was manager of the natural-gas and natural-gasoline division in Tulsa until 1935. He pioneered in developing stabilizer control and conceived the unit system of plant construction, which is now standard practice. He took an active part in the Natural Gasoline Association of America and served as its president for 2 years.

Smith worked in the Shell refinery division in the company's St. Louis office, and in 1938, became a full-time pipe-line man when placed in charge of products lines. He designed and built the Wood River-Columbus line, first of a type with completely automatic operation based on metering all products into and out of the line.

Crude Demand Estimate Drops for October

WASHINGTON. — The amount of crude petroleum needed to meet demands in October is 4,771,000 bbl. daily, the Bureau of Mines forecast last week, a drop of 19,000 bbl. daily from the September figure. Estimated demand for the third quarter was 4,860,000 bbl. daily, with a demand of 4,720,000 bbl. daily forecast for the fourth quarter.

The daily October demand forecast of 2,120,000 bbl. for Texas remained the same as for September, as did the forecast of 264,000 bbl. for Kansas, 214,000 bbl. for Illinois, 100,000 bbl. for New Mexico, and 47,000 bbl. for Michigan. The October forecast for California was 5,000 bbl. less than the September figure of 855,000 bbl. daily, and that for Oklahoma was 384,000 bbl. daily, a 2,000-bbl. drop from the September figure. The Louisiana estimate was 383,000 bbl. daily, 1,000 bbl. daily less than September.

Hobart to Head N. L. G. I.

CHICAGO.—H. P. Hobart, of Gulf Oil Corp., was elected president of the National Lubricating Grease Institute at its meeting here October 3. The other officers elected are: J. R. Corbett, Cato Oil & Grease Co., vice president; E. V. Moncrieff, Swan-Finch Oil Corp., treasurer; George W. Miller, Battenfeld Grease & Oil Corp. of New York, recording secretary. Carl E. Bolte is continued as executive secretary.

THIS 1946 WEEK

REGULATION— Indiana Standard announces intention to file court appeal of controversial August order of Federal Trade Commission on gasoline-marking practices. . . . Case has wide interest because of implications to petroleum jobbers. . . . ¶Under Secretary of Interior Chapman expresses belief satisfactory regulations covering public-land leasing will be worked out. . . . Statement made after meeting of government and oil-industry officials in Denver. . . . ¶Interstate Oil Compact Commission forwards proposed uniform reports and forms to state regulatory bodies for suggested adoption. . . .

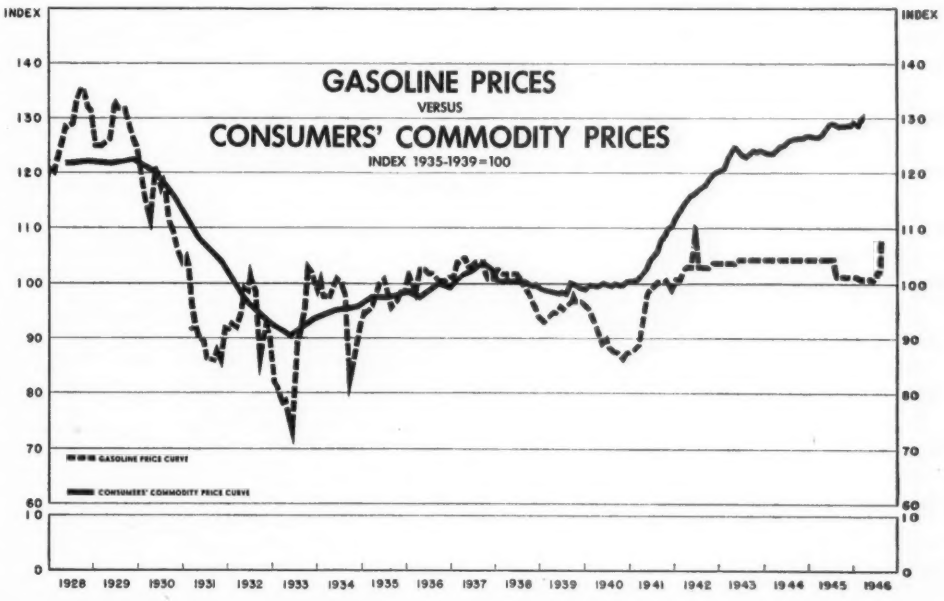
TRANSPORTATION— War Mobilization, Reconversion Office reverses decision to allow continued use of leased government cars by L.P.G. shippers. . . . Order to surrender first group of 45 cars brings strong protest from Phillips Petroleum Co. . . . L.P.G. consumers expected to suffer if order is carried out. . . . Mississippi congressman, W. M. Whittington, plans investigation of tank-car situation; other inquiries indicated. . . . ¶Warren T. Spies, Chicago attorney, asks Federal Power Commission to back legislation giving right-of-way emiment-domain rights to gas-transmission projects approved by FPC. . . . ¶Great Lakes Pipe Line opens new line from Sioux Falls, S. D., through Marshall, Minn., to Watertown, S. D. . . . Announces initial gasoline deliveries through line probably will be changed to distillates in December. . . .

REFINING—Lead shortage grows more critical. . . . CPA recognizes Ethyl Corp. will be able to fulfill about 60 per cent of current allocations. . . . Automobile industry executives perdict many cars will be laid up this winter as a result of order giving preference to lead for new-car batteries. . . . ¶Seven killed, damage placed at $300,000 in explosion and fire at Sun's Marcus Hook refinery. . . . Statement by J. Howard Pew, Sun president, says disaster "had its origin in the failure of a packing gland in a pump of the alkylation unit of Plant 15. . . . The result was a leakage of gas which ignited. . . . This started a fire of intense heat which subsequently weakened a large tower that fell. . . . This released its highly volatile contents which spread and flashed into flames." . . .

CONSERVATION—Secretary of Interior Krug in talk at American Gas Association meeting urges natural-gas industry to press conservation efforts, says present waste of gas with oil production is unjustified. . . . Declares gas wasted in 1943 represents equivalent of 26,000,000 tons of coal and that "present and prospective supplies of gaseous and liquid hydrocarbons are not of such magnitude as will permit us to engage in 'wasteful practices.'" . . .

PRODUCTION—Bureau of Mines placed October demand at total of 4,771,000 bbl. daily. . . . Forecast estimates fourth-quarter demand for domestic crude at about 4,720,000 bbl. daily with total runs to stills of foreign and domestic crude of about 4,750,000 bbl. daily. . . . ¶Production figures for week ended October 5 show drop in Texas output of 24,000 bbl. daily responsible for most of United States decline of 39,305 bbl. to 4,751,375 bbl. daily. . . . ¶Wilcox Oil Co. files first application under 1945 Oklahoma law for compulsory unit operation. . . . Asks order unitizing 360 acres in Okfuskee County. . . .

THE GOVERNMENT— Behind-the-scenes maneuvering in Washington indicates another fight in progress within the administration on the issue of control vs. decontrol of industry. . . . Observers believe advocates of decontrol will win and that the Government will begin dropping wage, price, and other controls before the first of the year. . . .



Facts on the price of gasoline, such as portrayed graphically by this chart, are often too little recognized by the consuming public. Despite the soaring index of commodities in general, retail gasoline prices held steady for 4 years and last winter took the almost-unique distinction of actually dropping in price. The upward rise in gasoline prices in August followed the general crude-oil price advance. The chart is from Shell News of Shell Oil Co., Inc.; the gasoline-price curve represents the weighted average 50-city retail price excluding tax; the general commodity index is compiled by the Department of Labor

New A.A.O.D.C. officers include this group: Front row—E. C. Brown, Brown Drilling Co., vice president for California; Brad Mills, Dallas, executive vice president; S. R. Mealy, Mealy-Wolfe Drilling Co., vice president for Rocky Mountain and Central Mid-Continent area; Guy B. White, Delta Drilling Co., Evansville, Ind., vice president for Illinois, Michigan, Indiana, and Kentucky; J. Doyle Settle, Dallas, association secretary. Second row—C. J. Paine, F. B. Paine Drilling Co., Dallas, treasurer; J. E. Warren, Carl B. King Drilling Co., Tulsa, president of the association; H. C. Milhoan, Milhoan Drilling Co., Tulsa, vice president at large

Drilling Contractors Scan Rising Costs And Threats to Free Enterprise

by Neil Williams and George Weber

SAN ANTONIO.—The rapid spiral of drilling costs and threat of government encroachment on the system of free enterprise received a major share of attention from 622 representatives of drilling contractors, service and supply companies at the sixth annual meeting of the American Association of Oilwell Drilling Contractors here October 1-2. In the midst of a critical period during which increasing costs of labor, supplies and equipment appear to be outstripping the gradual reduction of drilling costs brought about by greatly improved efficiency, costs of all phases of the drilling industry were subjected to close study.

In his opening address before the association, William T. Payne, retiring president, drew attention to the trend which was referred to again and again throughout the meeting. He noted that the 6 per cent increase in number of wells drilled in 8 months of 1946 over a like period last year, and the strong indication of continuation of the upward trend in drilling activity, indicated, on the surface, a prospect for good business at adequate profit for the drilling contractor. He warned, however, that this may become a paradox if contractors fail to take closer account of current erratic price conditions. He stated that in the face of the advancement in cost of supplies alone, ranging from 13 to 35 per cent, drilling is being done at contract prices below cost in too many instances.

Walter S. Hallanan, temporary chairman of the National Petroleum Council, declared in an address at the drilling contractors' meeting, that the only difference between Office of Price Administration control of the oil industry and the government-sponsored plan to place American oil production under control of an international authority and to import one-half of the nation's consumption "adds up to the difference between nationalization of the industry and internationalization of it."

Danger in Proposal

He asserted that if the recent proposal of spokesmen for the State Department and other government agencies that the nation import 50 per cent of its oil were put into effect, it would "ring down the curtain on an industry which has always gone forward to greater heights of achievement."

The expanding role of the drilling contractor in the industry at large and the increased representation of contractors in the association was reflected in a deeper sense of responsibility on the part of members. A gradual increase in the contractor's share in drilling activity has reached the point where 80 per cent of all wells currently drilled in this country are contracted, whereas the figure a few years ago was 50 per cent. Contractors were reminded of the growing market for their services in foreign fields. J. E. Brantly, president of Drilling & Exploration Co., Inc., pointed specifically to the contractor's future possibilities in Latin America. As guest speaker at the annual banquet he presented an ethnic study of Latin American people, summarized oil possibilities in Central and South America, and spoke strongly for better Interamerican relations.

New officers for the coming year are: J. E. Warren, Carl B. King Drilling Co., Midland, Tex., president; H. C. Milhoan, Milhoan Drilling Co., Tulsa, vice president-at-large; C. J. Davidson, Davidson Drilling Co., Fort Worth, vice president for West Texas and New Mexico; Emery Carper, Carper Drilling Co., Artesia, N. M., vice president for cable tools; Joe S. Morris, Allen & Morris, San Antonio, vice president for Gulf Coast; S. R. Mealy, Mealy-Wolfe Drilling Co., Tulsa, vice president for Rocky Mountain and Central Mid-Continent; E. C. Brown, Brown Drilling Co., Long Beach, vice president for California; Guy B. White, Delta Drilling Co., Evansville, Ind., vice president for Illinois, Michigan, Indiana, and Kentucky; E. E. Pickering, Pickering Service Co., Houston, vice president for well servicing; and C. J. Paine, F. B. Paine Drilling Co., Dallas, treasurer. Brad Mills, Dallas, was reelected executive vice president, and J. Doyle Settle, Dallas, secretary.

Thirteen new directors also were elected. They include: Mark Gardner

(Continued on page 72)

Informal Snapshots Of Conventioneers

Left: Past presidents of the A.A.O.D.C. posing here are: J. E. Brantly, Drilling & Exploration Co., Inc., Los Angeles and Dallas; N. H. Wheless, Wheless Drilling Co., Shreveport; A. H. Rowan, Rowan Drilling Co., Fort Worth; Howard P. Holmes, Two States Drilling Co., Oklahoma City; William T. Payne, Big Chief Drilling Co., Oklahoma City

Right: Fred Christenelli, Baroid sales division of National Lead Co., Houston; Harry Leyendecker, City National Bank, Houston; T. N. Davey, Mogco Pipe Line Co.; E. O. Buck, Rowan Drilling Co., Houston; Victor LeMay, Mid-Continent Supply Co.

Below: S. W. Webster, Emsco Derrick & Equipment Co., Dallas; Zack Brinkerhoff, Jr., Brinkerhoff Drilling Co., Casper, Wyo.; John J. Blankerhorn, Brinkerhoff Drilling Co.

Above, right: Gilbert Prince, Prince Drilling Co., Houston; Len Walker, B & W, Inc., Houston; Earl Gray, Abegg & Riehhold, Houston. Left: Walter S. Hallanan, Plymouth Oil Co., Pittsburgh; Albert A. Buchanan, Buchanan Drilling Co., San Antonio. Right: George P. Livermore, George P. Livermore, Inc., Lubbock, Tex.; E. J. Nicklos, Nicklos Drilling Co., Houston

International

WORLD-WIDE OIL DEVELOPMENTS

Passage of Favorable Legislation to Open Search for Oil in Guatemala

by Warren W. Burns

NEW YORK. — Unless the Guatemalan Government effects a sudden change in current plans to open a large portion of that country to petroleum exploration and eventual exploitation by outside interests, geological and geophysical crews should be at work there some time in the next 12 to 18 months.

And it is practically a certainty, when the "proposed petroleum legislation for Guatemala" becomes law, that among the first to apply for concessions will be Standard Oil Co. (N. J.) since this company was carrying on survey work there just a year ago last August, withdrawing only when government and company officials failed to agree on concession terms.

The report on the proposed petroleum legislation was written by Max T. Thornburg, former vice president of the California Texas Oil Co., Ltd., and Bahrein Petroleum Co., Ltd. (Standard Oil Co. of California and The Texas Co. subsidiaries) and the first petroleum adviser to the U. S. State Department. Thornburg is now an independent consultant.

The practically inaccessible jungle and swamp of Peten—the northernmost state of the republic—and the Lake Izobal area, southeast of Peten and near the Atlantic Coast, are the areas which geologists think the most favorable crude-oil areas.

While it is probable that Jersey Standard, Shell, and other companies with large capital reserves will be among the first to seek Guatemalan concessions, when the proposed legislation becomes law, one of the principal aims of the legislation—as proposed by Thornburg—is to allow small companies to participate as producers on a scale commensurate with their resources.

From experiences of some oil companies which had their holdings expropriated in Mexico and Bolivia, Thornburg recognizes that the possibilities of expropriation constitute a major potential problem. The proposed legislation lists the following causes as the sole causes under which the government could legally cancel concessions or seize holdings:

1. Failure to exploit with reasonable diligence at least some part of the area under concession; or to make payment of the annual surface tax within 1 year following the date due.
2. Failure to commence work within 1 year after obtaining permission for a manufacturing project or a pipeline concession.
3. Obtaining a concession by illegal means.

The concessionaire affected would be given a "reasonable opportunity to remedy it (the government's complaint) as an alternative to such declaration of cancellation."

Length of Concessions

Exploitation concessions would be for 40 years from the date of issuance and subject to all provisions of the law. "Upon expiration of said period," the proposed law reads, "the nation shall reacquire, without payment of any indemnity whatsoever, the parcels granted; and likewise become the owner of all the permanent works that may have been constructed and at that time remain thereon.

"If the government should resolve not to exploit the concession directly, but rather to grant it anew, the former concessionaire shall have, during the period of 60 days, the preferential right to obtain it under equality of conditions."

A royalty charge of 12½ per cent would be paid by all concessionaires to the state. Natural gas, which is to be returned to the formation, would not be subject to royalty. The state would have the choice of taking the crude in kind or in cash, but would not have the right to alter its decision in any calendar quarter without written notice to the concessionaire at least 30 days prior to the commencement of such a quarter in which a change was to be made. The government might elect to reduce the royalty when it has been proved satisfactorily that the cost of production—including taxes and royalty—makes commercial production impossible.

Regarding import duties, the proposed law provides that, for a period of 10 years following the granting of any concession, imports would be free of customs duty on all equipment, machinery, instruments, supplies, and accessories which are neither produced nor manufactured within the country and which are exclusively for use in work relating to the concession.

Vacuum Oil to Build Australian Refinery

NEW YORK.—Plans for a $3,000,000 refinery at Paisley, Australia, are now being made by the Vacuum Oil Co., Ltd., Australian subsidiary of Standard-Vacuum Oil Co.

The refinery, to be run on Venezuelan crude, will process lubricating oils, gasoline, naphtha, gas oil, lubricants, and asphalt. Daily capacity is being set at 1,500 bbl.

To be located on a 200-acre block 14 miles from Melbourne, the buildings will include an office and cafeteria, workshop, boiler house, lubricating and asphalt plant, and several processing buildings.

Samuel G. Cruikshank, who has been with Standard-Vacuum's Australian subsidiary 22 years, has been named refinery superintendent. For the last 10 years, Cruikshank has been chemical engineer in charge of manufacturing at the company's Melbourne office. At present he is in the United States studying latest refinery developments and buying some equipment for the projected plant. However, as much of the material and equipment as is obtainable in Australia will be purchased there, and all technicians will be Australians. Cruikshank plans to return to Australia around the end of this year.

Meanwhile, construction on the re-

finery of Bitumen & Oil Refineries Australia, Ltd.—a company in which California Texas Oil Co., Ltd., owns 40 per cent of the stock—is under way. Construction of this refinery started early in June. (The Oil and Gas Journal, June 15, page 82). It will use crude from the Persian Gulf and is expected to be completed next June.

Four Years Necessary for Balikpapan Reconstruction

BATAVIA, Java.—The 500,000,000-guilder (about $185,000,000) postwar reconstruction plan, projected by Royal Dutch-Shell interests for their war-destroyed Balikpapan refinery in the Netherlands East Indies will not be completed for about 4 years, according to authoritative sources here.

The project includes the most modern refining equipment and an extensive housing program. A large area along Balikpapan Bay is slated to be cleared and leveled prior to the erection of installations and storage tanks. The shortage of transportation facilities will, for the time, restrict activities to clearing away of rubbish.

A few wells in the "Louise" oil field on Balikpapan are again in operation, producing about 18,000 tons (about 126,000 bbl.) a month. The 18,000-ton monthly production is being refined locally by a small plant built from the only usable parts left from the bombing of refinery. Some of the products are consumed locally, the remainder being exported.

Search for Natural Gas Begun in Czechoslovakia

LONDON.—A large-scale search for natural gas in Czechoslovakia is now getting under way, according to reliable sources here. Operations started in the province of Moravia near the Polish border. Gas already found in this region reportedly contains 90-95 per cent of methane.

The natural-gas activities apparently are part of the $400,000 program instigated earlier this year by the Board of Stalin Works which is planning to expand operations considerably by the end of this year.

Several wells have been drilled in the Austrian province of Burgenland in the region of the lower Pinka River. While most of the tests have been shallow — around 800 ft. — one well is projected to over 6,000 ft. and as of the middle of September was said to be down to 3,300 ft. Further exploration continues with preparations being made to extend more drilling near Guossing, the southernmost town of Burgenland.

Seven trainloads of equipment from Germany's Soviet zone, including 5,000 tons of machinery, are destined for use in the reconstruction of the Oswiecim synthetic-gasoline plant in Poland.

Meanwhile, reports indicate that Romania has ordered some urgently needed equipment from Czechoslovakia in exchange for Romanian oil.

Dutch Coevorden Field Now Producing 630 Bbl. Daily

THE HAGUE.—Production in Holland's war-discovered Coevorden oil field, located in the northeastern province of Drente, is now around 630 bbl. daily, according to official sources here. The crude is transported by tanker to Pernis, near Rotterdam.

Recently the N. V. de Bataafsche Petroleum Mij. (Shell) refinery at Pernis went back on stream, processing about 11,700 bbl. of charging stock daily.

The surface soil around Coevorden is of glacial and preglacial origin. At about 1,050 ft. Cretaceous beds have been found. The preglacial beds are fine sand or loam and occur at depths of from 30 to 66 ft. The sand runs to an average thickness of 75-80 ft. Recent tests indicate that richer oil structures are just across the border in Germany. The Coevorden area is adjacent to Germany, and all concessions are held by the Netherlands Government.

During the occupation of the Netherlands, the Germans evidenced much interest in developing the Coevorden area, but through efforts of Dutch engineers who successfully sabotaged Nazi efforts, production for the entire year of 1943 was held to less than 2,000 bbl. Immediately after Holland's liberation, daily production shot up to approximately 1,500 bbl. daily but this has since settled down to about 630 bbl. daily. However, exploitation of this field during the next few years may result in a much higher output.

International

WORLD-WIDE OIL DEVELOPMENTS

French Company Contracts For Venezuelan Production

NEW YORK. — Cie. Francaise des Petroles, Paris, France, has contracted to buy the entire crude-oil production of Pantepec Oil Co. of Venezuela for a 3-year period, it was announced this week.

The French company, which holds a 23.75 per cent share in Iraq Petroleum Co., Ltd., and controls refining interests in France through an interest in Compagnie Francaise de Raffinage, will pay posted Texas Gulf Coast prices for the Pantepec crude.

William F. Buckley, Hartford, Conn., chairman of a Pantepec stockholders committee, also announced Cie. Francaise des Petroles had obtained a 3-year option to acquire half of Pantepec 50 per cent interest in the Venezuelan contracts Pantepec holds with Atlantic Refining Co. and Creole Petroleum Corp. Under another agreement, the French company also has agreed to pay Pantepec an estimated $4,375,000 for its half of the cost of 25 wells in Roble field and 50 wells in Mulata field over 3 years.

GUESTS WIN PRIZES AT NOMADS' GOLF TOURNAMENT

Winners of guests prizes at the golf tournament held recently by the New York chapter of Nomads: R. D. Moriarty, head of materials division, Creole Petroleum Co., Caracas; H. W. Cobb, vice president of Standard-Vacuum Oil Co.; and V. P. Johnson, of W. M. Kellogg Co.

Oil fields and Dutch Shell Group refineries in East Indies

Dutch-Shell Group Restoring East Indies Properties Demolished on Eve of Invasion

EMPLOYES of the Royal Dutch-Shell group of companies in the East Indies blew up, wrecked, or sabotaged six refineries with a daily capacity of 160,000 bbl.; oil fields in eight regions with a total company production of about 108,000 bbl. per day; and nearly 7,000,000 bbl. of stored oil and tankage; in less than 3 months, during December 1941, January and February 1942, when the Japanese overran the islands.

Plans had been made in advance to see that the Japanese derived as little benefit as possible from the oil fields and refineries of the East Indies, and were approved by the British and Netherlands governments. These plans were executed in good shape, in spite of Japanese threats of death penalties to all European civilians if the properties were destroyed. The Japanese fought desperately to stop the destruction, but succeeded to a material extent in only one instance. A surprise attack behind the fighting front by paratroopers dropped on the large Pladjoe refinery in South Sumatra upset the prearranged demolition schedule. New destruction plans had to be improvised in the midst of a battle right in the refinery grounds, but even so, substantial portions of that plant were blown up.

The wartime experience of the East Indies was similar to that in other parts of the world, proving it is almost impossible to put an extensive oil field completely out of production permanently, provided the conqueror comes prepared with special equipment and trained crews. Some wells can be cleaned out and some surface equipment repaired or replaced. The Japanese came prepared, incomplete reports indicating that among other things, they brought 150 drilling rigs with them.

With refineries, it proved a different story. In most cases the Japanese were only able to construct or reconstruct some small skimming plants. Even at Pladjoe, where the paratroopers partly upset the demolition plans, the Japanese were never able to get the plant back to 50 per cent capacity.

The details of what was done, what is known about Japanese reconstruction, and the present status follow:

Northwest Borneo.—This was the logical first point for Japanese attack, so demolition of the 20,000-bbl. Sarawak refinery and the Miri and Seria oil fields was started December 8, 1941, and completed before the Japanese arrived about December 15.

The fields were recaptured from the Japanese in July 1945. In retreat they had fired the flowing wells at Seria and blown up all major installations. The fires were put out, and rehabilitation of the fields and reconstruction work on the refinery started. Drilling was resumed early in 1946, regular shipments of crude started in March, with current production about 10,000 bbl. daily, and

International

This article summarizes the present status and future plans for the rehabilitation of the East Indies properties of the Royal Dutch-Shell group of companies. Prearranged demolition plans were so successful, that in spite of large-scale repairs made by the Japanese, who arrived thoroughly equipped for such work, 200,000 tons of equipment, machinery, and materials will have to be procured. At least 27 strings of drilling tools, 600 pumping units, 40,000 kw.h. power generating capacity, and 200 miles of oil-well tubular goods will be needed. In addition an unknown portion of 3,000 miles of 4-in. and larger gathering and trunk pipe lines must be replaced, plus a high percentage of the prewar 20 million barrels of tankage.

further substantial increases are expected by the end of the year.

Northeast Borneo.—During the attack of January 10, 1942, on Tarakan Island, 400 wells were junked by explosives or dropping tubing in the hole, surface pumping equipment blown up, all storage tanks and 700,000 bbl. of stored oil destroyed.

The Japanese drilled 173 new wells during occupation, and managed to produce a substantial amount of oil, some estimates running as high as 5,500,000 bbl. They probably made a special effort here, since the physical properties of the crude are such that after simple dehydration, it can be used for either diesel or boiler fuel.

Tarakan was recaptured in May 1945, and the Japanese attempted to destroy the work they had done. Repairs started immediately after recapture; some production was resumed in June, and by January 1946, about 255 wells were in shape to produce. Lack of storage and pumping facilities hampers reconstruction, but it is hoped to restore sufficient handling facilities for 50 per cent of the prewar 14,000-bbl. daily production by the end of 1946.

East Coast Borneo.—The 46,000-bbl. refinery at Balikpapan and the oil fields of the Samarinda district, with some 450 wells, were destroyed on January 22, 1942. The refinery was a complete plant with wax and lube units, and auxiliary drum and can-making factories. It took the Japs a long time to get even part of the refinery into commission again, and upon its recapture in 1945, they destroyed all they had rebuilt.

Reconstruction is slow. One 4,200-bbl. pipe still is repaired and operating, and a second unit, same size, should soon be operating. Four 35,000-bbl. tanks, two for diesel and two for residual fuel, were repaired and at the end of May 1946, it was possible to handle oil to ships over two wharves.

Prewar, the fields of the Samarinda area (Sanga Sanga, Anggana, and Sambodja), produced about 17,000 bbl. daily from some 450 wells. Practically all the wells were wrecked. At present eight crews are working on the wells. At Sanga Sanga, the Japanese constructed three large earthen oil-storage reservoirs, the contents of which are now gradually being pumped into tanks, with a recovery of about 225,000 bbl. to date.

About 120 miles southwest of Balikpapan, the Tandjoeng field had been discovered shortly before the war. There were eight potentially flowing wells, but no gathering or handling facilities had been built. Believing they would be of little use to the Japanese, they were not destroyed.

Since the Japanese surrender, it has been found they had erected a makeshift topping plant, through which at times they managed to process as much as 1,000 bbl. per month. After recapture, by November 1945, this plant was being operated at about 350 bbl. daily, with crude from one flowing well, to supply local needs for gasoline, kerosene, and diesel oil. A similar primitive topping plant was built by the Japanese in the Sanga Sanga field, and is now being operated in the same fashion as the Tandjoeng plant.

Ceram and New Guinea.—The Boela and Lemoen fields, producing about 2,000 bbl. daily, on the island of Ceram, and the oil fields and operations center at Babo in New Guinea were destroyed on January 30, 1942.

Information about the Ceram fields is currently unavailable, and due to its relative unimportance compared with other areas, no rehabilitation work has been attempted.

Three fields had been discovered before the war in the Vogelkop portion of northwestern New Guinea. As much as possible was done to make them useless prior to capture by the Japanese. Due to their remoteness, information thus far is only fragmentary, but it is not believed the Japanese made any serious effort to produce these fields. Vigorous efforts are being made to resume operations there.

Sumatra.—The oil fields in South Sumatra, tributary to the 60,000-bbl. Pladjoe refinery, were destroyed on February 14, 1942, after the Japanese paratroopers dropped on the refinery. Shortly thereafter the North Sumatra refinery of Pangkalon-Brandon, capacity about 24,000 bbl., and the oil fields of that region were destroyed by employes.

The Japanese moved into the oil fields tributary to the Pladjoe refinery with the special equipment they had brought with them and managed to restore partial production within 1 year, drilling some 60 wells during the occupation. Because of political disturbances fostered by the Japanese, it has been impossible to make any appreciable progress in rehabilitation.

No details have become available on the destruction at the Pangkalon-Brandon refinery, in North Sumatra, other than that prearranged plans were carried out. Japanese reports claim one pipe still of 14,000-bbl. capacity was still usable, although partly destroyed again by Allied bombing in January 1945. The Jap-

Once a productive oil well, now a mass of twisted and broken pipes, this well was one of the many recaptured from the Japanese by Australians in the invasion of Tarakan Island. (Australian Official Photograph)

anese attempted to transfer two furnaces and a fractionating tower to Sawit Sebrang, for erection of a 3,500-bbl. topping plant. At Langsa they erected a 250-bbl. topping plant. About 60 per cent of the 2,500,000-bbl. tankage at the Pangkalon-Brandon plant and at its shipping terminal 9 miles distant at Pankalan Soesoe, have been destroyed.

It is estimated the Japanese obtained around 9 to 10 million barrels of oil from these fields during occupation, most of it from the prolific Rantau field and the comparatively new field of Paloeh Tahoehan. They drilled one wildcat near Pangkalon-Brandon (around Tandjong Poera); one near Iee Tabeu (in Acheen); and had made a location near Belawan, a deep-sea port on the east coast.

Owing to political difficulties, the operating personnel have not yet been admitted to the North Sumatra area, so it is impossible to check the accuracy of this information.

Java.—Two refineries in Java, Tjpoe-Rembang, capacity 7,500 bbl., and Wonokrome-Soerabaya, capacity about 2,500 bbl., and connecting oil fields, were destroyed shortly after the middle of February 1942. The Tjpoe plant consisted of one pipe-still unit, one continuous still battery, a cracking plant, wax plant, and candle factory. Unchecked reports are that the Japanese managed to restore the pipe still in 1943, although in bad operating condition; the continuous still battery was never restored.

The pipe still at the Wonokrome plant has completely disappeared, but a 500-bbl. asphalt plant is intact, although the auxiliary plant is badly damaged.

The prewar production of the fields around Tjpoe-Rembang was about 17,000 bbl. daily, excess over refinery requirements being shipped elsewhere by water. Based on unchecked information, a rough estimate of production obtained by the Japanese during nearly 4 years of occupation is about 10 million barrels. They appear to have had three steam drilling rigs working in the Kavengan field.

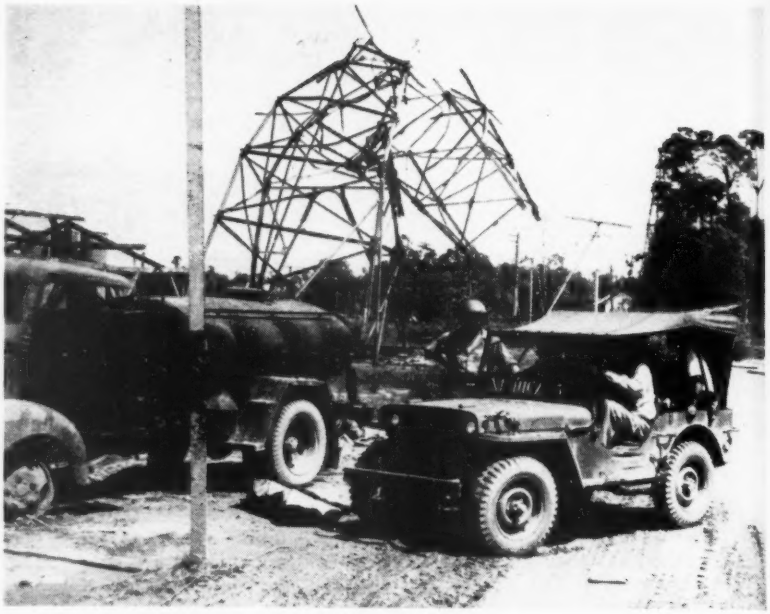
The Kroeka and Lidah Keelon fields in the Soerabaya area served the Wonokrome refinery, and have been found in reasonable condition. The Japanese apparently succeeded in repairing the Kroeka field, and by drilling 14 new wells, obtained from the whole producing region around 1,750,000 bbl. of oil.

Summary

An estimated over-all picture of the Japanese activity in the producing fields of the Dutch-Shell group, based on incomplete information, is as follows:

1941 PREWAR ANNUAL PRODUCTION VS. AVERAGE ANNUAL DURING OCCUPATION

	1941 (bbl.)	Avg. per year Jap. occupation	% of 1941
Tarakan	4,730,000	1,493,000	32
Pladjoe	16,631,000	10,044,000	60
P.-Brandon	5,853,000	2,613,000	45
Java	4,503,000	3,266,000	72
Subtotal	31,717,000	17,416,000	55
Balikpapan	6,819,000	Unknown	
Ceram	697,000	Unknown	
Grand total	39,233,000		



Devastated section of the Tarakan oil fields as officers of a Netherlands Indies Technical Battalion inspect the damaged area to plan immediate reconstruction of the oil fields (Official Netherlands photograph)

The Japanese had obviously made advance preparations for large-scale repairs, and concentrated on the Pladjoe and Java fields, where there was a comparatively large number of flowing wells.

Although impossible to predict when rehabilitation work on the Sumatra and Java fields can begin, plans have been worked out to put 15 strings of drilling tools in the fields, and refinery equipment has been ordered. An eight-string drilling program for Borneo and a four-string exploration program for New Guinea is lined up.

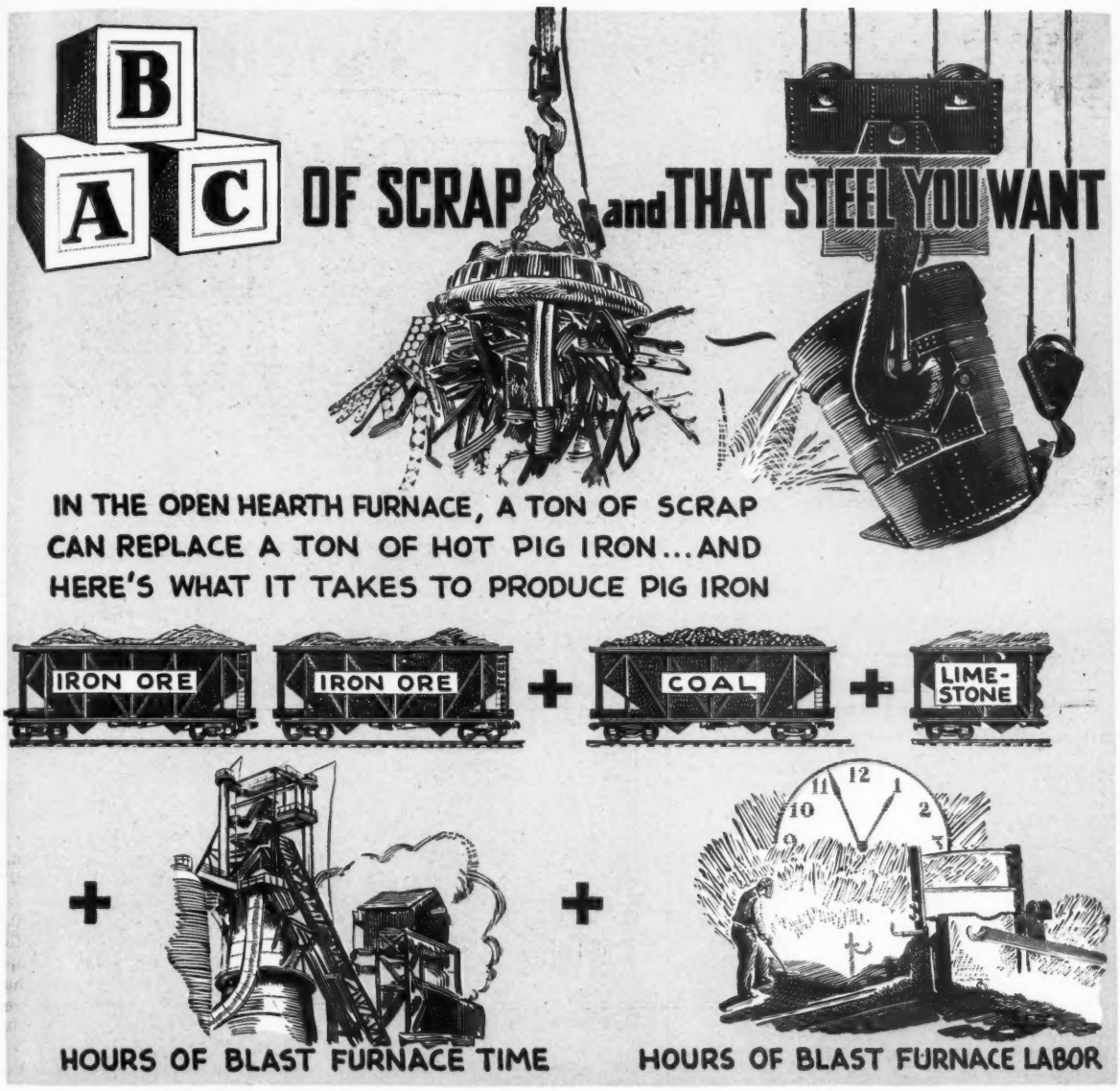
The total requirements for all rehabilitation in the East Indies will depend largely on the conditions eventually found at the refineries and fields in Sumatra, but preliminary estimates call for 200,000 tons of equipment, machinery, and materials. To a large extent these materials have been listed and some even ordered, but currency exchange difficulties influence the choice of manufacturers and therefore time of delivery.

It is estimated 600 pumping units will be required for the preliminary construction program. Thirty electric power-generating units, aggregating 40,000 kw.h., are on order. The drilling and casing program will call for 200 miles of tubular goods, exclusive of what may be required to rehabilitate the prewar 3,000 miles of pipe lines of 4-in. and larger size that were used in field operations. Prewar tankage totaled more than 20,000,000 bbl. capacity, and it is known that the replacement percentage for this item will be much higher than for pipe lines.

South Africa May License Liquid-Fuel Industry

CAPE TOWN, South Africa.—In an effort to obtain control of the possible establishment of a liquid-fuel-from-coal industry, the South African Government plans to introduce legislation, at the next session of Parliament, making such manufacture subject to license.

The Department of Commerce and Industries has announced that the Government would assume control. Moreover, if it should be decided to issue one license for the manufacture of the total estimated quantity of fuel that can be economically produced in the Union, without protection against imported fuel, no more licenses will be issued.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OF SCRAP and THAT STEEL YOU WANT
IN THE OPEN HEARTH FURNACE, A TON OF SCRAP
CAN REPLACE A TON OF HOT PIG IRON... AND
HERE'S WHAT IT TAKES TO PRODUCE PIG IRON
IRON ORE
IRON ORE
COAL
LIME-
STONE
HOURS OF BLAST FURNACE TIME
HOURS OF BLAST FURNACE LABOR

TO you "scrap" may be just worn-out machinery, broken pipe and such junk---worth nothing to your business.

But it IS worth a lot to your business delivered to the steel producer. Scrap may be the means of supplying you with more of the new steel and steel products you want.

As every buyer knows, steel is produced by "blending" hot pig iron and scrap in the open hearth furnace. Each ton of available scrap can replace a ton of pig iron. The greater the shortage of scrap, the heavier the drain on pig iron supply to produce a given tonnage of steel.

But every extra ton of pig iron produced calls for the use of approximately two extra tons of iron ore, one extra ton of coal and one extra half-ton of limestone, processed in a blast furnace, involving many extra hours of time and labor. It is obvious that there is a limit to America's blast furnace capacity. So the quickest, most effective way to produce maximum steel tonnage now is to find and use more scrap.

Help yourself to more steel by starting more scrap into the channels that serve the mills.

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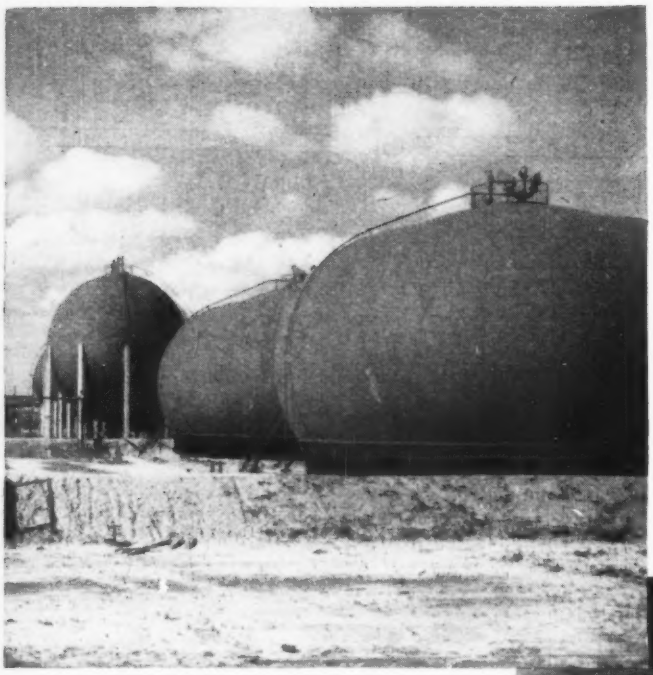
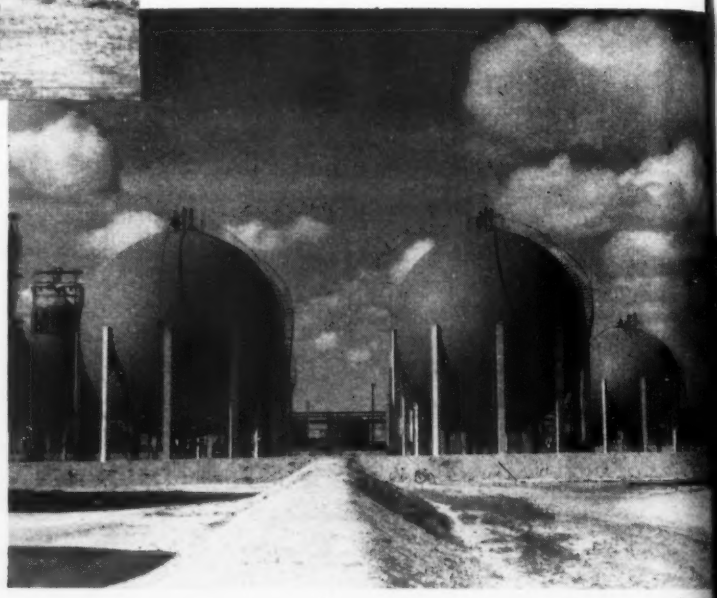


Another Refinery



Standard Capacity HORTONSPHERES

Designed in accordance with API-ASME Specifications

Capacity in Bbls. (42 U.S. Gals.)	Diam. in Ft. and In.	Range in Pressure in Lbs. per Sq. In.
1,000	22'3"	40-200
1,475	25'3"	30-150
2,000	28'0"	30-150
2,530	30'3"	30-150
5,000	38'0"	30-100
6,000	40'6"	30-100
7,500	43'3"	30-100
10,000	48'0"	30-75
12,000	51'0"	30-75
15,000	54'9"	20-60
20,000	60'6"	10-50
25,000	65'0"	10-40

Standard Capacity HORTONSPHEROIDS

CAPACITY IN BBLS.	WORKING PRESSURE LBS. PER SQ. IN 2½	5	10	15	20	25	30
2,500	H	H	S	S	S	S	S
5,000	H	H	S	S	S	S	S
7,500	H	H	S	S	S	S	S
10,000	H	S	S	S	S	S	S
15,000	H	S	S	S	S	S	S
20,000	H	N	S	S	S	S	S
25,000	H	N	N	S*	S*	S	S
30,000	H	N	N	S*	S*	S	S
40,000	N	N	N	N	N	S	S
50,000	N	N	N	N	N		
60,000	N	N	N	N	N		
80,000	N	N	N	N	N		
100,000	N	N	N	N	N		
120,000	N	N	N	N	N		

S — PLAIN TYPE HORTONSPHEROID
N — NODED TYPE HORTONSPHEROID
H — HEMISPHEROID FURNISHED
*Noded type is furnished if soil bearing does not permit use of smooth type.
Intermediate sizes and pressures can be furnished if desired.

The aerial view on the opposite page shows a group of ten Hortonspheres and two Hortonspheroids at the Pan American Refining Corporation's plant. The closeup views on this page were taken at the same location. The Hortonspheres are used to store butane; and the Hortonspheroids store isopentane.

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It's the Pan American Refining Corporation's plant at Texas City, Texas—another of the nation's great refineries that use Hortonspheres and Hortonspheroids. For storing hydrocarbons that range in volatility from motor gasoline to natural gasoline use the Hortonspheroid. For storing highly volatile liquids and gases use the Hortonsphere. These two pressure storage tanks can help refineries accomplish two important goals . . . *increase plant throughput and reduce production costs!*

& IRON COMPANY

WASHINGTON WATCHING

BY HENRY D. RALPH

A Field for Investigation

WASHINGTON.—The pressure tank car mess in which the OWMR has got itself is an example of the confusion and lack of coordination in government agencies characteristic of the postwar attempt to control the economy, and there is also a suspicion of undue influence or inside favoritism.

During the war there was a big demand for pressure tank cars for the munitions, synthetic rubber, aviation gasoline, and other programs, so the Government, which controlled all priorities, built cars and assigned them to various uses. The Government also directed liquified petroleum gas producers to serve many new war-housing projects which had no other source of fuel and leased 483 cars to L.P.G. companies with the understanding that they could buy them after the war if they wished.

Came the end of the war and the demand for L.P.G. continued so the cars were kept in this use. But when the companies asked to purchase the cars they got no replies. This is not too surprising, considering the many reorganizations of the surplus disposal agency now known as War Assets Administration and the evidence of its utter confusion and lack of business methods as currently being disclosed by several congressional investigations.

However, last spring the Army decided it could reduce its task of feeding occupied territory by supplying fertilizer so the Germans and Japanese could grow their own food. It reopened some of its ammunition factories for the production of fertilizer, but the companies selected to operate these plants said they needed pressure tank cars for moving liquid ammonia. So somebody got OWMR to order the L.P.G. companies to turn their cars over to the fertilizer people, and this was done without inquiring into the effect of the L.P.G. business.

Phillips Petroleum Co. was nicked for 19 of the first batch of 45 cars ordered surrendered. In spite of the fact that Phillips had applied to WAA last May to purchase the cars, OWMR issued an urgency certificate directing WAA to sell them to the operator of an Army ammonia plant. Phillips protested, so OWMR told it to keep the cars. Then WAA told Phillips to disregard the OWMR instructions and threatened legal action if the cars were not surrendered.

Phillips protested that WAA had not given it an opportunity to buy the cars and offered the full government cost price, notwithstanding that 40 per cent of this had already been paid the Government in rentals. WAA replied that such cars could be sold only on sealed bids and anyway Phillips would not be allowed to buy them because the law requires "wide distribution."

To this Phillips replied that of 485 ammonia and other pressure tank cars so far sold by WAA, 240 cars, or 26 per cent, went to one buyer, 90 to another, 45 to another, and the remaining 100 to 12 buyers. The answer was another order from OWMR reversing its former position, directing Phillips and other L.P.G. shippers to surrender the cars,, and instructing WAA to sell no more pressure cars to anyone.

This could all be written off as Army pressure to bull through its own program regardless of consequences except for the fact that one of the L.P.G. shippers learned that a New York law firm with close connections in the Government was getting copies of all its correspondence with WAA and OWMR. A number of congressmen whose constituents may now go without fuel this winter because of the shortage of L.P.G. cars are interested in the situation, so more may be heard of it in the near future.

Draft-Deferment Tally

LESS than 200 key operating employes in the oil industry have been certified for draft deferment by the Civilian Production Administration since Selective Service resumed its calls on local draft boards September 1.

The Oil and Gas Division of Interior Department, which processes such deferment requests for CPA, has received to date approximately 360 requests from employers and has recommended exemption of about two-thirds of the men involved. Of these, CPA has approved 166 deferments and the remainder have either been rejected or are still in process. About 50 applications have had to be returned because they were not in proper form or failed to give adequate information about the importance of the employe involved. Deferment requests have come from all branches of the oil industry except that none have been received from small refiners to date.

More on the "Dead Horse"

THE only new fact about the Army's Canol project uncovered at last week's hearing by the Senate war-investigating committee was that the Joint Chiefs of Staff ordered it completed a month after they had cancelled plans for the military operations in Alaska the oil project was designed to support.

Some 3 years ago the committee had shown that the $133,000,000 Canol project had been continued in spite of opposition from the secretary of the navy, the petroleum administration, the Budget Bureau, and the committee itself, not to mention the oil companies who were ordered to do the work.

This final disclosure was not much help in saving the face of Adm. Ernest J. King, who signed the completion order as secretary of the Joint Chiefs of Staff. The committee had called this action a blot on King's record, and the admiral demanded a retraction, but his chief defense was that the rest of the Joint Chiefs were equally to blame. He gave no explanation why Canol was not abandoned, nor was there any in the hitherto secret files. It is a safe bet that the committee will stick to its statement that the Joint Chiefs acted simply to save the face of one of their members, Lt. Gen. Brehon B. Somerville, who started the project on inadequate advice and refused to admit his mistake.

Everyone agreed that Canol was a dead horse both before and after its completion, and the monument on its grave should be a reminder that the Government, particularly the military, should leave industrial problems to industry men.

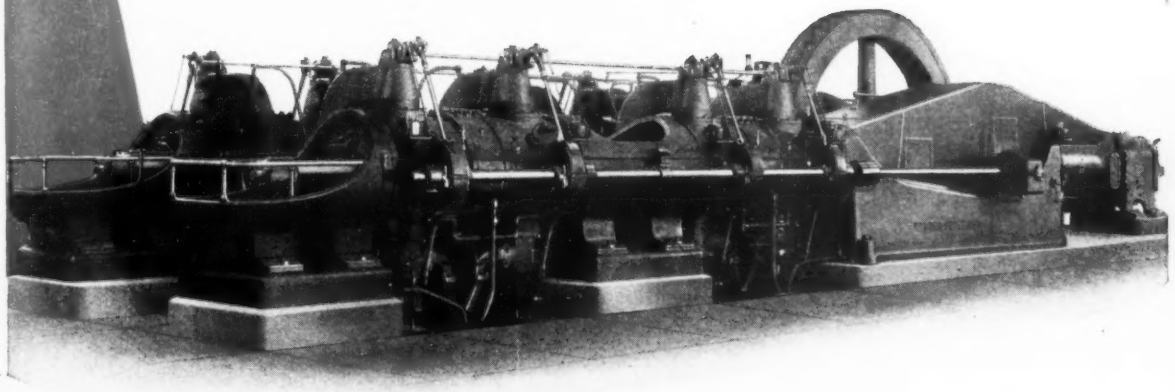
A New Big-Business Inquiry

THE petroleum industry will be one of the principal guinea pigs in the study of concentration of economic power which the House small-business committee will conduct in hearings opening October 15.

Advance billings of the show advertise it as more of an economic seminar than a typical congressional investigation. A five-man subcommittee, headed by Rep. Estes Kefauver of Tennessee, has been preparing the study for some weeks in cooperation with the Department of Commerce, and has called on the Department of Justice and the Federal Trade Commission for assistance and has

17 More
COOPER-BESSEMER HORIZONTALS FOR NORTHERN NATURAL...

A continued story of Efficiency and Dependability



Yes, this is a story of efficiency and dependability in compressor service. It's a continued story because Northern Natural Gas Company has picked Cooper-Bessemer compressors repeatedly for expansions of their important pipe line system, have now had 12 years of experience with these rugged horizontal units.

Now Northern Natural has again turned to Cooper-Bessemer — a fact that speaks for itself. Seventeen new horizontals, of the general type shown above, will bring an additional 15,400 compressor horsepower to the system — horsepower that can be depended upon . . . always . . . produced by these efficient units at a minimum of cost.

Cooper-Bessemer horizontal engine-driven compressors are built in four types, 19, 22, 24, and 26, ranging from 400 to 1650 hp. Modern V-angle units, Type GMV and GMX, are available in 4, 6, 8, and 10 cylinder sizes ranging from 200 to 1000 hp.

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Improved reactor design increases gasoline production of Houdry fixed-bed units

By redesigning the reactor tubes and changing the physical composition of the catalyst mass, Houdry engineers have accomplished a major improvement in the Houdry Catalytic Cracking Process.

By this latest evolution of the oldest commercial catalytic cracking process, the time required for catalyst change has been shortened approximately 80%, effecting a considerable reduction in operating costs. Increased production of gasoline also results because of higher on-stream efficiencies and improved distribution of oil vapor and regeneration air through the catalyst.

The new design is adaptable to all standard Houdry fixed-bed reactors and has already been applied to three twelve-case Houdry units, one of which has been operating for more than a year with notable success. Detailed reports will be furnished gladly to interested refiners.

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HOUDRY CATALYTIC PROCESSES

also asked these two agencies some pertinent questions about their activities.

The plan is to have government officials present facts about the competitive position of small-business units as regards big business and their views on what should be done about it. Following this, both big and little business men will be given the opportunity of making any rebuttal or additions they choose, and from there on the inquiry will just sort of develop as it goes along.

All three agencies have been asked to submit data on the extent and present seriousness of monopolies and concentration of economic power, what are the best ways to improve the competitive position of small business, how efficiently the present antitrust laws are being enforced, and what new legislation should be recommended. Prior to the resignation of Secretary Henry A. Wallace the Commerce Department completed its report, thought it has not yet been made public, and Representative Kefauver has already asked the new secretary, W. Averell Harriman, whether or not the department still stands on the Wallace policy regarding the concentration of economic power.

Some of the questions asked Justice and FTC suggest that these agencies themselves may be put on the spot, and the committee may inquire just how efficient they have been and what results they have obtained with their appropriations.

While the committee has no special investigating powers and cannot write legislation, the hearings may provide a sounding board for many old and new proposals aimed at big business, including divorcement of various branches of a vertically integrated industry.

The Widening Lead Shortage

MANY automobiles will be laid up this winter for lack of batteries, it is predicted by automobile industry executives, as a result of the latest lead-allocation order of the Civilian Production Administration. They say that replacement batteries available during the next few months will be only 10 to 20 per cent of the demand.

For some time the automotive industry has been asking the Government to do something to provide it with more lead, lack of which has been hampering production. But the industry was astounded when the relief came at the expense of replacement batteries. The CPA's fourth-quarter lead allocation cut 500 tons from the quota for battery production, but took this away from replacement batteries by giving preference to batteries going into new cars as original equipment.

JAMES FORRESTAL *RUSSELL B. BROWN* *FRED W. SHIELD*

Texas Mid-Continent Association Set for Houston Victory Meeting

HOUSTON.—With Navy Secretary James Forrestal making the keynote address, the Texas Mid-Continent Oil and Gas Association will hold its victory meeting here October 17-18 at the Rice Hotel.

The meeting will be the first general gathering of Texas petroleum men since 1943. Other speakers include Russell B. Brown, general counsel of the Independent Petroleum Association of America; Cedric Foster, news analyst; John S. Redditt, chairman of the Texas Highway Commission and former Sen. Clint C. Small of Austin. Forrestal will speak on "Oil and Victory" October 18. Theme of the meeting is the part which petroleum played in helping win World War 2.

Brown will speak at the opening session October 17, on "National Oil Policy." Redditt will discuss "The Oil Producer and the Gasoline Tax" at the same session, at which Fred W. Shield, San Antonio, association president, will make his annual report.

After a report by Paul W. Pitzer, Breckenridge, chairman of the association's theft-prevention committee, Foster, at the afternoon session, will talk on "Problems of the Postwar World," basing his discussion on experience as a war correspondent in the Pacific. Small will discuss "Price-Fixing by Government Agencies," particularly as it relates to natural gas.

The association's custom of presenting a distinguished-service award to the outstanding operator and company representative selected by a ballot of oil leaders, will be resumed. Bronze plaques will be presented by operators by W. R. Boyd, Jr., president of the American Petroleum Institute, and to the company official by Maston Nixon, Corpus Christi operator. Names of the recipients will be announced at the presentation.

The association will also resume its oil men's golf tournament, and prizes will be awarded at the membership reception and dinner the night of October 18. Two other dinners also have been scheduled, both the night of October 17, one for the press and the other for association directors. The nominating committee will meet at luncheon the same day before reporting through its chairman, W. A. Moncrief, Fort Worth. The resolutions committee headed by Curtis G. Condra, Fort Worth, also will report.

A.A.R. Board Forecasts Increased Rail Shipments

WASHINGTON—Rail shipments of petroleum and petroleum products during the balance of this year will be 3.8 per cent higher than during the fourth quarter of 1945, it is estimated by the Shipper Advisory Boards of the Association of American Railroads.

Actual freight-car loadings of oil were 452,545 cars during the last 3 months of 1945, and the boards estimate that oil loadings will total 469,636 cars during the final quarter of this year. The estimate for all freight for the quarter is 7,599,575 cars, an increase of 9.8 per cent over actual loadings of all freight the final quarter of 1945.

Quarterly estimates of freight-car loadings are made by 13 Shippers Advisory Boards, each including the traffic managers of larger shippers of petroleum and other important commodities, and their estimates in the past have been quite accurate.

Drilling Contractors Scan Rising Costs

(Continued from page 58)

and S. R. Mealy, Tulsa; C. J. Davidson, Fort Worth; Guy B. White, Evansville, Ind.; E. E. Pickering, Houston; and Emery Carper, Artesia, N. M. Directors-at-large are: Lester Shepherd, Bakersfield, Calif.; A. R. Dillard, Wichita Falls; Jack Burden, Mt. Vernon, Ill.; Ed Harmon, Evansville, Ind.; Leif Olson, Midland, Tex.; George Hannum, Wichita, Kans.; and William Broadhurst, Tulsa.

Research Program

The research committee, headed by the newly elected president, J. E. Warren, reported progress along two distinct phases of drilling: the study of drill-pipe failures and the vocational education on drilling muds. Operating on a $30,000 budget subscribed largely by individual contractors operating in the Permian Basin, the committee asked for a like sum to carry the work through the coming year. It was recommended that the financing of continued research and education projects be shared by a greater number of members to spread cost more representatively throughout the organization. A voluntary subscription of $100 per rig was cited as a fair figure if wider support is possible.

The drill-pipe failure study, for which the association has retained the services of Battelle Memorial Institute, has revealed three possible preventive practices; (1) Use of inhibitors in drilling through and below the salt section encountered in the Permian Basin; (2) use of drill pipe coated on the inside with plastic or zinc; and (3) substitution of separate drilling strings below the last salt stringers at about 4,000 ft. Sodium chromate or bisodum chromate have been found the best inhibitors. Use of drill collars immediately above the bit thus relieving compression on the remainder of the drilling string was recommended as universal practice when drilling hard formations. These findings of the general study were made to provide more immediate relief from the unusual drill-pipe failures by Permian Basin contractors. The studies will continue with recommendations for specific application of preventive measures.

Vocational mud training, sponsored during the past several months by the association, will continue next year in a number of drilling centers of the Mid-Continent and Gulf Coast. This fundamental education project is directed toward field men in an effort to improve the application of established mud techniques to drilling practices in particular localities.

Although research and training programs already under way will require all of the coming year, the research committee is interested in recommending further work to be sponsored by the association. Included as possible future programs are crooked-hole studies and expansion of the type of vocational training to other phases of drilling. The committee's underlying object throughout is improvement of the contractor's services to oil companies and reduction of drilling costs which now loom important in successively deeper drilling.

Safety and Insurance

Safety and insurance claimed much attention from members at the meeting. The safety program which the association has evolved for member use was recommended for wider adoption, and William Broadhurst, chairman of the committee, cited an accident reduction of 50 per cent and attendant savings of $35,000 in insurance rates on the part of one representative member company which adopted the program. With the active aid of the Bureau of Mines, 10 meetings of safety engineers with field men were held in drilling centers during the year, as part of the over-all education program for reducing accidents on the rig floor. The committee reported that 200 rigs now use the association's safety program, and a large volume of safety hints, posters, and manuals have been distributed to member companies.

Insurance costs as affected by accident rates followed in the committee's study. Despite the direct relationship which should exist between the two factors, however, it was found that rates for insurance of all types written for contractors varied widely not only between different districts but between large and small contractors. Such inequities have been and will continue to be subject to intense study of the committee, which will attempt to iron them out. Insurance experience tables compiled by the association were reported little used by insurance companies. Further safety education for contractors' drillers and other laborers was noted as meager.

Two possible measures to improve insurance services to contractors were cited. A California member who told of haphazard rate fixing on the Pacific Coast suggested that the association consider forming its own insurance company if inequities among commercial companies did not improve in the near future. He stated that rates on fire, blowout, and other similar insurance policies in his district varied over 300 per cent among different companies without apparent basis on experience tables or other similar data.

A more moderate measure is under study by the committee. It concerns an evaluation of proposals made by several insurance companies and a decision as to which will provide best coverage at most reasonable rates. When such a policy is decided upon in the near future, information concerning it will be passed on to all member companies. Should a sufficiently large percentage of contractors elect to accept such a policy it is believed that savings of about $100,000 yearly may accrue, and safety services would vastly improve with elimination of duplication.

Adaptation of power rigs to deeper drilling, use of larger-size drill pipe with full hole-bore tool joints as a means of facilitating drilling of deeper wells, and plans for inauguration of an educational program in human relationships for toolpushers and drillers were among the subjects receiving special consideration by the rotary-drilling practice committee in open session with C. W. Alcorn, Falcon-Seaboard Drilling Co., Houston, as chairman.

Large-Size Drill Pipe

There is a definite trend toward the use of larger-size drill pipe for deeper drilling, the committee reported. Specific reference was made to replacement of present 4½-in. strings with 5-in. o.d. pipe having a weight of 18 lb. per foot with an average weight of 22 lb. per foot with tool joints. One major company operating more than 50 rigs recently has standardized on this pipe for deep wells, it was pointed out, and has had highly favorable results. It was advocated that contractors as a whole give serious consideration to the adoption of this size pipe as standard for deep holes.

It was explained that the 5-in. pipe permits a 24 per cent greater volume capacity over 4½-in. pipe without increase in pump pressures, a particular help for power rigs. Specifically, circulation rates up to 1,000 gal. per minute have been obtained with the larger pipe as compared with from 700 to 800 gal. per minute through 4½-in. pipe with equivalent pressures. This, it was stated, makes possible the drilling of faster hole and lower costs. With pressure requirements reduced, much deeper holes can be drilled. At the same time it was emphasized that the 5-in. pipe is approximately 24 per cent stronger in torque and tension than the 4½-in. 16.50 lb. pipe commonly used and thus provides a greater safety factor. No change is necessary in size or type of tool joints required, and no elevating and other operating complications are involved over the 4½-in. pipe. It was recommended that the regular internal-flush 6¼-in. tool joint be used to increase the inside diameter for maximum volume capacity and the outside diameter for longer wear. While there might be slightly more wear on the tool joints, this is offset by less wear on the pipe.

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Latest Techniques Examined by Newsmen on Texas-Louisiana Trip

by Warren W. Burns

GALVESTON.—Working on a clock-like schedule which provided for everything from a detailed educational course on oil-production practices to actual field demonstrations, 30 oil-trade and daily publication representatives last week wound up a 7-day tour of the Texas and Louisiana areas. They were guests of Standard Oil Co. (N. J.) and Humble Oil & Refining Co.

As official host in Texas and Louisiana, H. C. Wiess, Humble president, was on hand at all times explaining production operations. Other top Humble officials who made the daily travels included Hines Baker, executive vice president; David Frame, vice president in charge of production; L. T. Barrow, vice president in charge of geology and exploration; Morgan J. Davis, chief geologist, and head of exploration department; Carl E. Reistle, Jr., production manager; and Douglas Ragland, assistant chief petroleum engineer.

Before witnessing actual demonstrations, Humble officials briefed the group and provided additional information, such as maps and diagrams. During oil field plane trips, officials explained what was below. A loud speaker in each of the two planes made announcements.

Perhaps the highlight of the trip was a visit to King Ranch in southwest Texas. Humble's Southwest Texas Division here currently is producing 13,450 bbl. from 202 wells.

East Texas field was "invaded" and demonstrations conducted on gun perforating by Lane-Wells Co.; electric log by Halliburton Oil Well Cementing Co. and gamma ray log by Lane-Wells.

Opening the week's educational course on Texas and Louisiana production, Wiess disclosed his company is considering the desirability of building a large plant, on the Gulf Coast, to convert natural gas into liquid fuels. The importance of gas conservation was stressed by both Wiess and Baker.

Touching on world reserves, Dr. Richard J. Gonzales, Humble economist, told the writers that Texas has 11,500,000,000 bbl., compared with 9,300,000,000 bbl. for the rest of the United States, and 38,100,000,000 bbl. of foreign crude.

Last half of the Texas-Lousiana oil trip was devoted to inspection trips through the Katy gas plant near Houston; the Schlumberger Well Surveying Corp.; and Hughes Tool Co. At Schlumberger plant, R. Henquet, vice president and general manager, told the eastern writers that a hard-formation sample taker—a new development—was about to be given final field tests, but that it would be 4 or 5 months before it was ready for production.

Another highlight of the trip was an inspection of marine drilling in the Red Fish Reef field, 7 miles offshore in Galveston Bay. Here, the newsmen witnessed a fishing operation, 9,981 ft. below the water surface. Projected depth of this well—37 State A—is 11,000 ft.

At New Iberia, La., Production Manager Reistle told newsmen that in about 8 months Humble will start work on a 90-ft. steel structure to be built 8 miles off Grand Isle in the Gulf. Grand Isle is 75 miles south of Houma, La. It is reported to be the first attempt to drill so far out in open water.

Gasoline Market Weaker; Crude Supply Tightens

A SLIGHT improvement in burning oils, a more pronounced weakening of gasoline, and a continued tight crude supply characterized petroleum markets in the Mid-Continent area last week.

The general scramble for crude, particularly among small refiners, was intensified by falling U. S. production which dropped 39,305 bbl. in the week ended October 5 to 4,751,375 bbl. daily. One veteran buyer said crude market is now the tightest in his experience and that "free" crude had all but disappeared.

Of the burning oils, No. 1 and range oil seemed to be in most demand. The thus-far only gradual improvement in these products is attributed in part to the heavy storage with which the industry is entering the winter. Figures for the week ended September 28 showed stocks of distillates, kerosene, and residual 31,653,000 bbl. above the total for the same 1945 week.

Spot-market gasoline was reported available at prices ranging around 6⅝ cents—⅜ cent under the market. One buyer said gasoline is becoming increasingly difficult to move. Natural gasoline, showing strong seasonal demand, was quoted early this week at 4¾ cents on the Group 3 basis.

The Bureau of Internal Revenue in Washington reported collections from the federal gasoline tax in August totaled $39,196,558, up 19 per cent from the corresponding 1945 month. Lubricating-oil tax receipts, however, were $6,093,151, down about 10 per cent from 1945.

DEATHS

Harry Davison, 47, owner and operator of Davison Drilling Co., died October 2 in Oklahoma City. He had been engaged in the oil industry for the last 25 years.

John L. Gorman, 47, assistant manager of sales, southern division, Mid-Continent Petroleum Corp., died October 4 in Tulsa. He had been with the company 16 years.

Louis P. Corbentz, 68, president of Choctaw Gas Co. and Capital Gas Co., died September 24 in McAlester, Okla.

Clarence C. Carroll, 62, manager of the Illinois producing division of Ohio Oil Co., died September 29 at his home in Marshall, Ill. He had been vice president of the Illinois Oil and Gas Association and a director of the Indiana Oil and Gas Association.

William E. Smith, 73, retired president of Standard Oil Co. of Kentucky, died October 2 in Louisville. He had been president of the company 18 years prior to retirement in 1945. He started working in 1897 for Standard Oil Co. (N. J.) and later was sales manager of Standard Oil Co. of New York, joining Standard of Kentucky in 1921 as vice president.

Patrick Dennis Bowlen, formerly active in the Texas and Alberta fields, died recently in Toronto.

Homer E. Havenstrite, 44, Los Angeles, superintendent for Russell E. Havenstrite, oil operator, was killed in an automobile collision October 2 near San Bernardino, Calif.

John E. Elliott, 60, petroleum consultant, who had been associated with oil companies in Oklahoma, Texas, and California, died October 5 in Tulsa. He had maintained offices in Tulsa the last 4 years, and in August organized a new company, Engineering Production, Inc.

Henry Allen Gray, Jr., 21, associated with Gulf Research & Development Co., was killed October 2 in an automobile accident near Liberty, Tex.

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East Texas field was "invaded" and demonstrations conducted on gun perforating by Lane-Wells Co.; electric log by Halliburton Oil Well Cementing Co. and gamma ray log by Lane-Wells.

Opening the week's educational course on Texas and Louisiana production, Wiess disclosed his company is considering the desirability of building a large plant, on the Gulf Coast, to convert natural gas into liquid fuels. The importance of gas conservation was stressed by both Wiess and Baker.

Touching on world reserves, Dr. Richard J. Gonzales, Humble economist, told the writers that Texas has 11,500,000,000 bbl., compared with 9,300,000,000 bbl. for the rest of the United States, and 38,100,000,000 bbl. of foreign crude.

Last half of the Texas-Lousiana oil trip was devoted to inspection trips through the Katy gas plant near Houston; the Schlumberger Well Surveying Corp.; and Hughes Tool Co. At Schlumberger plant, R. Henquet, vice president and general manager, told the eastern writers that a hard-formation sample taker—a new development—was about to be given final field tests, but that it would be 4 or 5 months before it was ready for production.

Another highlight of the trip was an inspection of marine drilling in the Red Fish Reef field, 7 miles offshore in Galveston Bay. Here, the newsmen witnessed a fishing operation, 9,981 ft. below the water surface. Projected depth of this well—37 State A—is 11,000 ft.

At New Iberia, La., Production Manager Reistle told newsmen that in about 8 months Humble will start work on a 90-ft. steel structure to be built 8 miles off Grand Isle in the Gulf. Grand Isle is 75 miles south of Houma, La. It is reported to be the first attempt to drill so far out in open water.

Gasoline Market Weaker; Crude Supply Tightens

A SLIGHT improvement in burning oils, a more pronounced weakening of gasoline, and a continued tight crude supply characterized petroleum markets in the Mid-Continent area last week.

The general scramble for crude, particularly among small refiners, was intensified by falling U. S. production which dropped 39,305 bbl. in the week ended October 5 to 4,751,375 bbl. daily. One veteran buyer said crude market is now the tightest in his experience and that "free" crude had all but disappeared.

Of the burning oils, No. 1 and range oil seemed to be in most demand. The thus-far only gradual improvement in these products is attributed in part to the heavy storage with which the industry is entering the winter. Figures for the week ended September 28 showed stocks of distillates, kerosene, and residual 31,653,000 bbl. above the total for the same 1945 week.

Spot-market gasoline was reported available at prices ranging around 6⅝ cents—⅜ cent under the market. One buyer said gasoline is becoming increasingly difficult to move. Natural gasoline, showing strong seasonal demand, was quoted early this week at 4¾ cents on the Group 3 basis.

The Bureau of Internal Revenue in Washington reported collections from the federal gasoline tax in August totaled $39,196,558, up 19 per cent from the corresponding 1945 month. Lubricating-oil tax receipts, however, were $6,093,151, down about 10 per cent from 1945.

DEATHS

Harry Davison, 47, owner and operator of Davison Drilling Co., died October 2 in Oklahoma City. He had been engaged in the oil industry for the last 25 years.

John L. Gorman, 47, assistant manager of sales, southern division, Mid-Continent Petroleum Corp., died October 4 in Tulsa. He had been with the company 16 years.

Louis P. Corbentz, 68, president of Choctaw Gas Co. and Capital Gas Co., died September 24 in McAlester, Okla.

Clarence C. Carroll, 62, manager of the Illinois producing division of Ohio Oil Co., died September 29 at his home in Marshall, Ill. He had been vice president of the Illinois Oil and Gas Association and a director of the Indiana Oil and Gas Association.

William E. Smith, 73, retired president of Standard Oil Co. of Kentucky, died October 2 in Louisville. He had been president of the company 18 years prior to retirement in 1945. He started working in 1897 for Standard Oil Co. (N. J.) and later was sales manager of Standard Oil Co. of New York, joining Standard of Kentucky in 1921 as vice president.

Patrick Dennis Bowlen, formerly active in the Texas and Alberta fields, died recently in Toronto.

Homer E. Havenstrite, 44, Los Angeles, superintendent for Russell E. Havenstrite, oil operator, was killed in an automobile collision October 2 near San Bernardino, Calif.

John E. Elliott, 60, petroleum consultant, who had been associated with oil companies in Oklahoma, Texas, and California, died October 5 in Tulsa. He had maintained offices in Tulsa the last 4 years, and in August organized a new company, Engineering Production, Inc.

Henry Allen Gray, Jr., 21, associated with Gulf Research & Development Co., was killed October 2 in an automobile accident near Liberty, Tex.

Shell's Rig Makes

Successful Attack on West Texas

THE hard digging encountered in deep West Texas wells is almost universally recognized, and during the past few years this area has been considered the proving ground for a great number of projects designed for reducing the time and expenditure normally required in negotiating thick beds of chert.

Perhaps one of the most successful attacks yet made on this drilling problem has been accomplished by Shell Oil Co. Inc.'s heavy mechanical rig with its world's tallest derrick.

In April 1945, when the rig was placed in operation near Monahans, Tex., it created wide publicity and interest. The derrick, rising sharply from the sand dunes to a gin-pole height of 203 ft., was visible from the Monahans highway and attracted a great number of curious oil men.

An example of extremely difficult West Texas digging will serve as a basis for understanding the reasoning followed by Shell engineers in designing the heavy mechanical rig. In one of the toughest chert sections ever drilled in that area, the interval from 12,829 to 12,954 ft. was drilled at a cost of 155 bits and round trips. This progress represented an average footage of 9.6 in. per bit; some bits did not account for a measurable amount, and others penetrated the formation only 3 in. The drilling of 125 ft. in this particular well required 4 months. Chert has a Moh hardness of 7 (diamond on same scale is 10) and its hardness is approximately the same as the steel of a file. Chert, or flint, will cut glass and indent some types of steel.

To meet this type of drilling requirement, the capacity of a drilling rig to accomplish two specific things was considered of paramount importance. First, to keep a maximum number of bits on bottom with minimum trip time; and second, to utilize the bits at a maximum degree of efficiency. While there are many minor special features incorporated in the design of the Shell rig, the tall derrick and automatic control are perhaps the most significant contributory features to the improved drilling performance obtained with this rig.

Special Features of Rig

As a matter of brief review, the novel features of the special rig are as follows:

The 178-ft. derrick. — The derrick was assembled during the war, and to avoid special design, Parkersburg used a standard 136-ft. A.P.I. derrick from the top down to the vee and added six girts of 7 ft. each, making a special vee. A 7-ft. substructure, mounted on steel grillage, gave an over-all height, from ground to gin pole, of 203 ft. The base of the derrick is 37 ft. 8 in., 7 ft. 8 in. greater than the conventional base.

Automatic control.—The automatic control, designed by Shell's engineering department, consists first of a speed increaser giving an over-all increase of drum speed of 816 to 1 to the control brake shaft. The brake on this shaft is automatically put on or off in proportion to decrease or increase of weight-indicator reading, which reading is, in turn, a reflection of increase or decrease of weight on the bit, by a control mechanism tied into the weight indicator.

By setting the pilot control, the driller is able to set any desired weight on the bit and the controller maintains this set weight constant within plus or minus 750 lb.

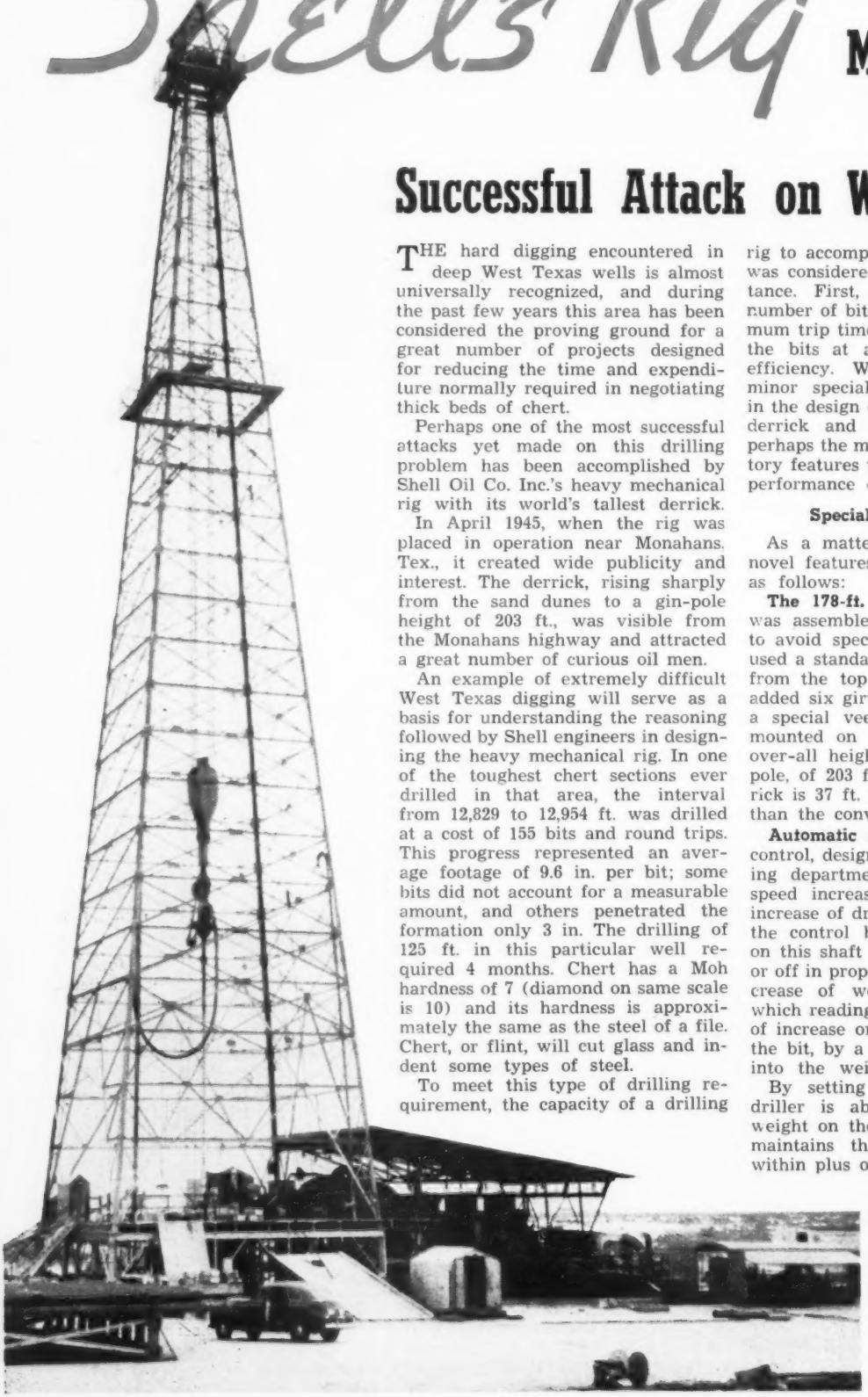


Fig. 1—This is one of the "most talked about" new drilling developments in West Texas. The tall derrick is an important part of the plan to cut costs

by E. H. Short, Jr.

It is estimated that the special features and one extra engine on this rig, beyond that usually installed in West Texas, cost about 7 per cent of the over-all rig cost. As a contrast, the first well drilled resulted in a saving of about 23 per cent of well cost. This saving was over three times the cost of the extra features used on the rig.

Chert

Special drill pipe.—In order to reduce circulating pressures in deep drilling, a special string of 5 9/16-in. drill pipe was used. This string was made up of standard A.P.I. Grade E Range 3 drill pipe with a special requirement of 42-44 ft. range length, with 4½ to 5¾-in. o.d. by 3 5/32-in. i.d., extra-hole tool joints, flash-welded on to the pipe. A groove was cut at the thickest part of the pin end of the tool joint to enable the driller to see the break point clearly when coming out of the hole.

Four-engine drive.—In view of the requirement for deep drilling that either slush pump should be available for mixing mud or standby, and that the engine powering the rotary table should preferably not be connected to any engines which are operating pumps, four 6-cylinder engines were included in rig design to obtain the utmost flexibility. Incorporation of all main engines into one transmission permits the maximum use of available horsepower and breakdown of one engine usually affects the performance of the rig only slightly. The engines operate on natural gas and deliver a peak total of about 1,200 hp. at 800 r.p.m.

As connected, the rotary table is driven by No. 1 engine, the standby pump can be driven by No. 2 or Nos. 2 and 3 engines, and the main pump by No. 3, No. 4, or Nos. 3 and 4 engines. The hoist can be powered by any or all of the engines. All engines were generally used on round trips.

Mud ditch and mud tanks.—Mud tanks were included in the design of this rig in order to reduce losses and quantities of special muds used, and to avoid the expensive necessity of building satisfactory pits in the sand dunes of the Monahans field, or in the caliche which occurs at the surface in many parts of West Texas.

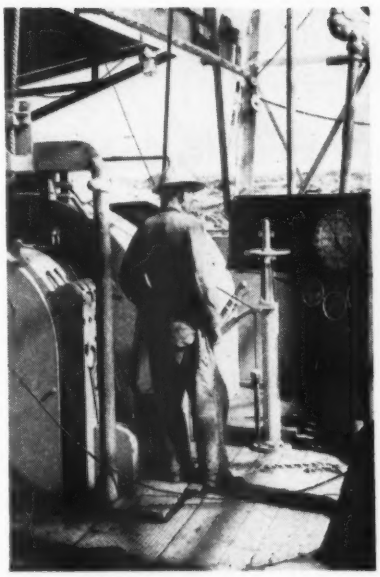
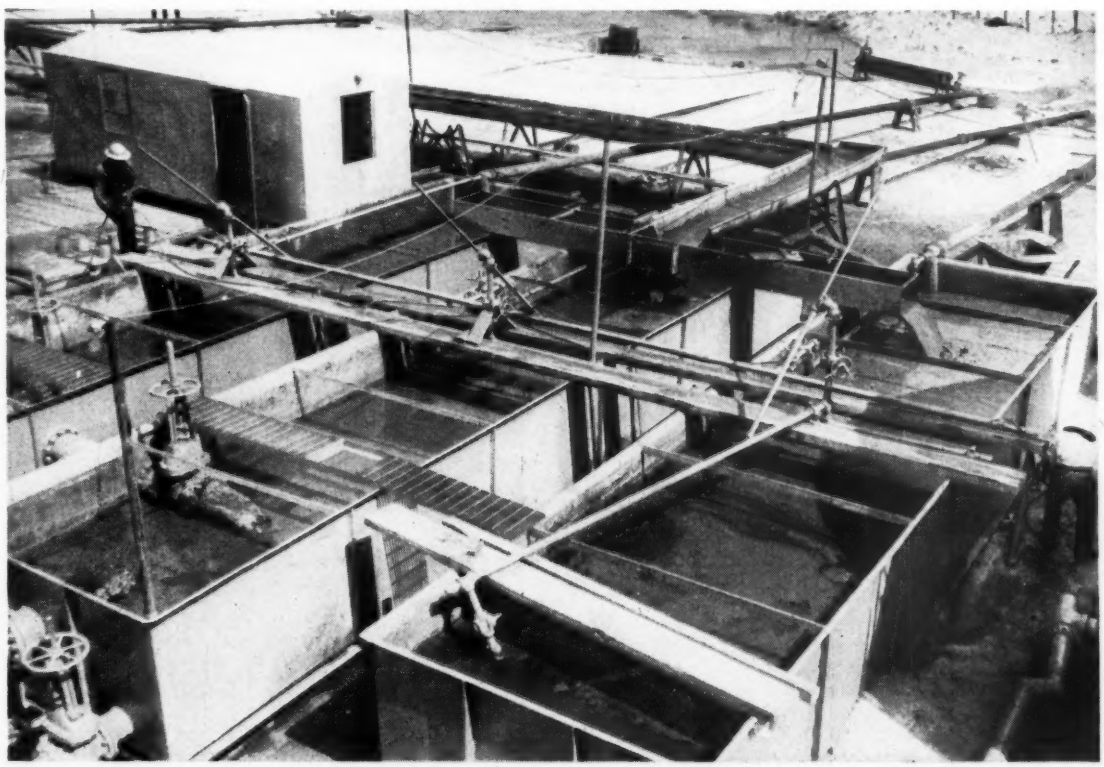


Fig. 2—Driller's position and automatic control on left of weight indicator

Auxiliaries. — The main auxiliary unit was designed for use with Cam-

Fig. 3—View of steel mud tanks



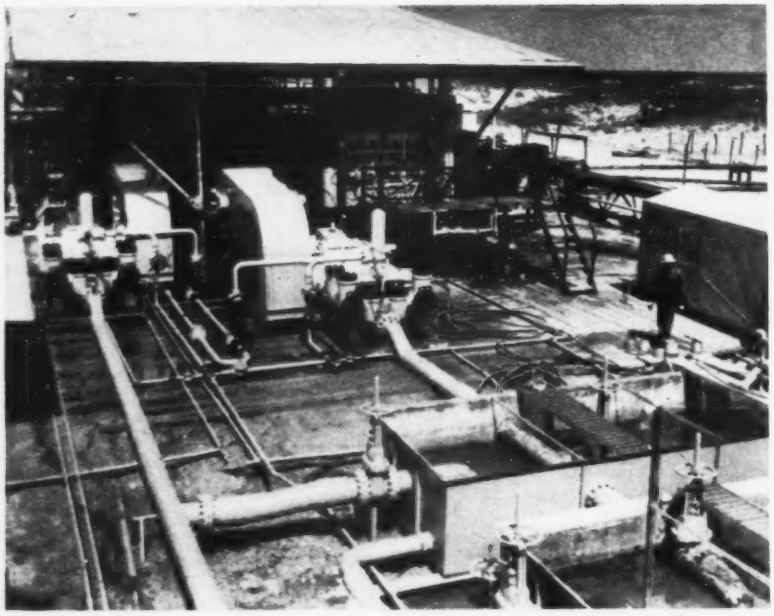


Fig. 4—View showing mud pumps and manifolding to mud suction tanks

eron type SDA blowout preventers, which require a high pressure for closure. In order to be sure that, in case of main-rig shutdown, the blowout preventer could be closed, a 5 by 10-ft. power pump of 2,000 lb. maximum working pressure on the fluid end was installed on the auxiliary unit, together with a 250-lb. two-stage air compressor, air receiver, a 10-kw., 120-volt d.c. generator and a 1-in. centrifugal pump. This equipment was powered by a gas engine capable of driving all units at one time.

The rig is furnished with a duplicate air compressor, driven by the main transmission. A 15-kw., 120-volt constant-voltage variable-speed generator is also driven from the transmission. Both generators are connected through a transfer switch to the rig power system. A "Quick-rig" type lighting system furnishes light and power.

Mechanical "mule."—This Mechanical Manufacturing Co. device was designed to provide mechanical assistance to the derrickman, especially in "catching" stands of pipe which are missed when going in the hole and particularly for setting back and stabbing heavy stands of drill collars used on West Texas rock-bit drilling.

Mechanical Performance of Rig

For the most part, the comparative performance of this rig is based upon operating data of a rig without its special features in the same field, designated in this article as "West Texas Control." The drilling conditions and depth of this control well were the same as encountered in 7 Sealy Smith drilled by the heavy mechanical rig. Other comparisons of round-trip time studies are based upon heavy steam Gulf Coast rigs.

Compared with West Texas Control (and making allowance for possible differences in crews) it appears that at least a 30 per cent round-trip saving was made by use of the tall derrick. At comparable depths 3.25 hours were required for an average round trip on West Texas Control which was equipped with a conventional derrick. The average round trip with the tall derrick required 2.275 hours, which represents a saving of 58½ minutes per round trip. Based on a total of 231 trips, 9½ days were saved on the drilling of the first well. The cost of the tall derrick and extra cost of erection over the conventional derrick was paid out by the 9½-day saving, with a profit of more than $1,000 left over.

In analyzing the derrick performance, no credit is given for the reduced maintenance of tool joints, tongs, rig clutches, engines, etc., caused by one-third fewer stands pulled and run. The reduced crew fatigue and increased safety caused thereby on deep trips is also a significant factor. It is reasonable to estimate that all the above factors should realize a profit per well at least equal to the direct time saving caused by the derrick.

In connection with the use of a tall derrick it should be mentioned that the advisability of its use is dependent upon deep drilling requiring a large number of round trips. The exception on this might be in the case of a marine rig where derricks are rarely torn down.

In order to determine the number of jobs for payout of a tall derrick, Shell engineers have developed the following tentative formula, which assumes that the over-all savings are twice the actual time savings:

$$(0.60\ TCN)n = K + En$$

or

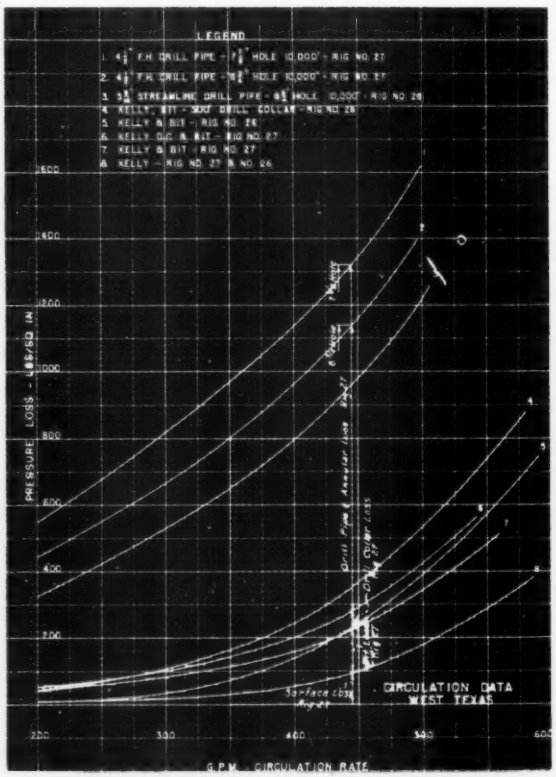
$$n = \frac{K}{0.60\ TCN - E}$$

where

T = Time taken for one trip at average round-trip depth* in

*The depth of the average round trip is obtained by adding the depths of each round trip made on a well and dividing by the total number of round trips made.

Fig. 5—Circulation data-Shell special rig 26 compared with conventional rig 27


LEGEND
1. 4½" F.H. DRILL PIPE - 7⅞" HOLE 10,000' - RIG NO. 27
2. 4½" F.H. DRILL PIPE - 7⅞" HOLE 10,000' - RIG NO. 27
3. 3½" STREAMLINE DRILL PIPE - 6¾" HOLE 10,000' - RIG NO. 26
4. KELLY, BIT - 900' DRILL COLLAR - RIG NO. 26
5. KELLY & BIT - RIG NO. 26
6. KELLY DIC & BIT - RIG NO. 27
7. KELLY & BIT - RIG NO. 27
8. KELLY - RIG NO. 27 & NO. 26
PRESSURE LOSS - LBS/SQ IN
G.P.M. - CIRCULATION RATE
CIRCULATION DATA
WEST TEXAS

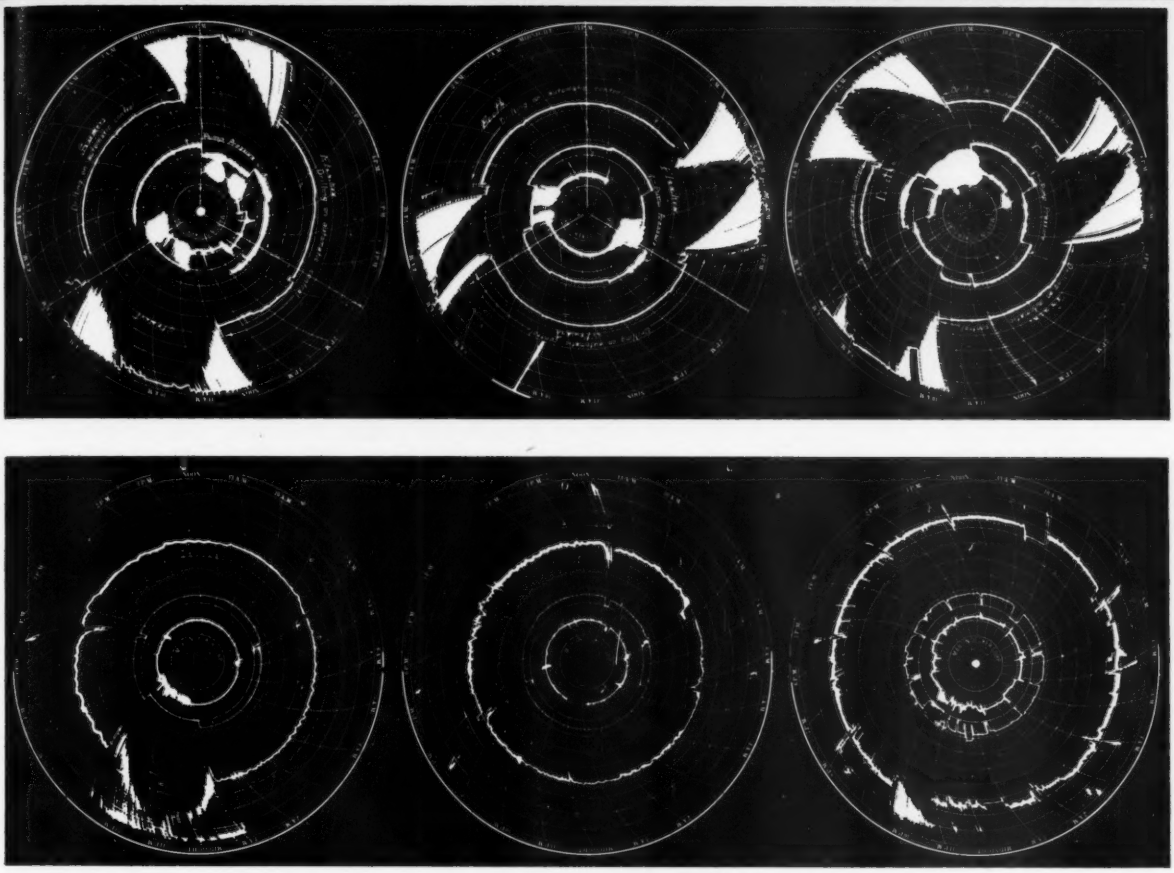


Fig. 6—Comparison of typical "automatic" drilling charts (top) with those by "hand feed" weight control (bottom)

field in question with a conventional derrick.

C = Rig-operating cost per hour.
N = Estimated number of round trips required to drill well.
n = Number of wells to pay out derrick.
E = Increased cost of erecting and tearing down tall derrick over usual derrick.
K = Increased first cost of tall derrick and substructure over usual derrick.

As an example, assume the following values in the formula:

T = 3.25 hours (at 7,911-ft. depth of average round trip).
C = $33.3 per hour.
N = 230
K = 4,050
E = 2,500

Then

$$n = \frac{4{,}050}{0.60 \times 3.25 \times 33.3 \times 230 - 2{,}500}$$

$$= \frac{4{,}050}{12{,}500}$$

or, approximately 0.324 wells.

If the figure "n" becomes more than 2, the desirability of the derrick becomes doubtful. It can be seen that on low numbers of round trips, the time saving becomes low and the profitability disappears.

Automatic control saves 113 bits.—All other bit-operating factors being almost identical on this rig and on

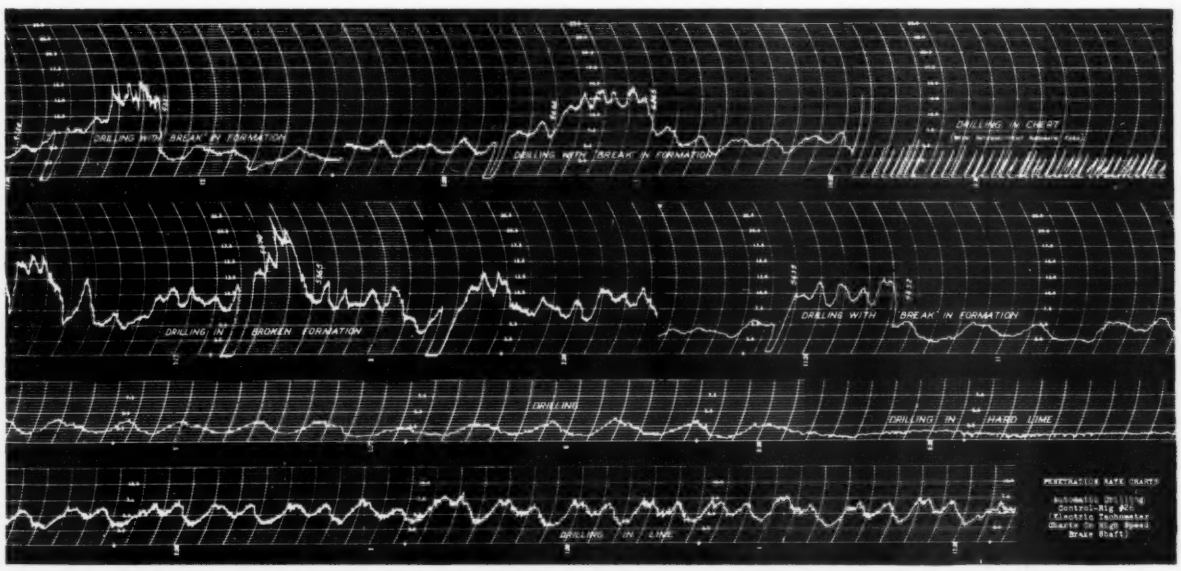


Fig. 7—Penetration rate charts

West Texas Control as far as can be determined, it appears rather definitely that 113 fewer bits were used on the Shell rig than would be expected on straight manual operation.

Despite the automatic control, due credit must be given to the drilling foreman and crews because the pulling of the bits when worn out was dependent upon their judgment. The penetration rate recorded on the control, however, gave clear visible indication of lowering drilling rates and was thus of great assistance to the drillers in determining when a bit was worn out. Once on bottom, however, automatic drilling performed the work. The bit types were identical on both the special rig and W. T. Control and similar bit weights were carried on both.

The saving of 113 round trips on this rig at an average round trip time of 2¾ hours accounts for a saving of approximately 13 days. The combined saving in bits and the drilling time paid out the cost of the automatic control and left a profit of over six times the cost of the control.

The bits run on this well drilled the footage, outside the chert and surface hole, in 74 days less time than required by W. T. Control. The chert section was drilled in 18 days less time, making a total of 92 days saved by the special rig as compared with the W. T. Control.

The saving in time which could be attributed to the tall derrick and automatic controls appears to be rather clear cut. However, an equitable distribution of days saved to the proper factor necessarily involves a number of arbitrary assumptions. Shell engineers associated with the design and subsequent operation of the rig have been inclined to allocate a sizable portion of the total number of days saved to the drilling crew and field men in charge, as shown in the following allocation of time saving:

Cause for saving in days	Days
Tall derrick	9.5
Improved watching by tool pusher and crew of bit performance while drilling in chert (50 per cent of actual saving)	9
Better time, as compared with W. T. Control, in testing, coring and fishing (estimated)	10
Company crews, alert for competitive drilling performance against W. T. Control—newness of special rig, quicker rigging-up and less connections to make while drilling, etc.	30
Days estimated saved by accumulated drilling experience in this field available to special rig	4.5
Total days saving actually made below surface pipe, not attributable to automatic control	63
Total actual days saved	92
Attributable to automatic control (92-63)	29

Drill pipe.—The performance of the streamlined drill pipe used with this rig brought out some interesting facts. The original decision to use this pipe was based upon a consideration of the following advantages and disadvantages:

1. Greater circulating capacity with the same pressure.

2. Streamlined annular flow to avoid blowouts and danger of swabbing action when coming out of the hole.

3. Flush outside diameter resulting in less tool-joint wear and distribution of wear over pipe.

4. Smooth rotation with less whip and fatigue action on the pipe.

5. Streamlined metal cross-section of joint, making smooth stress flow through joints.

6. Suitable handling stiffness in Range 3 for transportation and use in derrick.

7. 45-ft. joints save 33⅓ per cent of tool joints, making over-all pipe cost equal to 4½-in. internal flush, Range 2. The lift plugs involve an additional cost of about 5 per cent of the cost of the string.

The disadvantages of this special pipe, compared with 4½-in. o.d. drill pipe, brought out by those connected with the operation of the rig are as follows:

1. Use of elevator plugs for lifting pipe.

2. Weight of pipe about 15 per cent greater than 4½-in. o.d. drill pipe.

3. Requires 55-ft. kelly.

4. Complicates fishing jobs when washing over is necessary due to smooth exterior.

The use of elevator plugs cost no extra time and were of little inconvenience after the crews became accustomed to them. On two occasions, elevator plugs became loosened when going into the hole; however, no accidents resulted therefrom. A sledge hammer was used to make up and break out the plugs; however, under muddy conditions this practice is hazardous and a pneumatic hammer is now being tried out for this purpose.

The break in the pipe joints was easily visible by the aid of the indicator ring cut in the joints. This is a valuable feature on flush pipe and should be used whenever it is possible without endangering the strength of the metal. The 4½-in. extra hole joints, which were made 3 5/32-in. bore to give greater resistance to collapsing and sticking when stabbed, gave extremely good performance.

The full weight of each 135-ft. stand, or about 3,100 lb., was resting on each joint when being made up, since the elevators were lowered below the elevator lift plugs to prevent backing out of the plug. Only one galled joint was experienced. This is in spite of the fact that heavy swaying of the pipe when going into this hole causes binding which slows down makeup rates.

There was no trouble with pin breakage, which had been though possible on account of the increased stiffness of the 5⅛-in. pipe with relation to the joint as compared with the 4½-in. pipe for which the joint was designed. This drill pipe was also used to drill the surface hole, which is an extremely rough service for which it was not intended.

Outside wear on joints and pipe appears almost negligible. The pipe made over 230 round trips to an average depth of 7,811 ft., or about the same number of trips required on three Gulf Coast wells of the same depth of 10,500 ft. The pipe rotated about an average of 1,000 revolutions per foot of hole drilled as compared with about 500 revolutions per foot on a Gulf Coast well.

This means that, on one well of 10,500 ft., the string did as much actual work as on six Gulf Coast wells or of 63,000 ft. of drilling in the latter area. Gulf Coast formations are, however, more abrasive than those in West Texas and the streamlined pipe remains to be proven for wear under such conditions.

Reduction in pressure experienced with this pipe as compared with 4½-in. drill pipe are below those originally anticipated in that the drill pipe and annular loss shows a pressure reduction of only about 25 per cent below 4½-in. drill pipe. Since the readings were taken on different wells with muds of different characteristics, it is probable that further checking of these figures is necessary. Calculations indicate that a 50 per cent pressure reduction over 4½-in. should be obtained at given flow rates.

In general, the design of the streamlined drill pipe and joints appears very good and has substantiated the expectations. There is an indication however, that the use of pipe which does not require lifting plugs is preferable, wherever extreme pressure-loss requirements do not demand the larger-sized pipe. At this time, also, there is no satisfactory outside drill-pipe cutter which can work on the streamlined pipe in territories where washing over and cutting is necessary.

Mechanical mule.—For this particular set of conditions this device provided valuable assistance in handling the heavy strings of drill collars, and, according to those connected with drilling operations, the original cost of the tool was paid for in the time savings made on the first well.

Fuel and water consumption.—From an inspection of meter charts, the peak fuel consumption rate noted at the inlet to the fuel line was just under 100 M.c.f. per day. The surge capacity of the line was evidently sufficient to provide any instantaneous peaks required at the rig. A daily average of about 75 M.c.f. of gas was consumed on the rig.

Since the full load consumption of the engines is at the rate of about 288 M.c.f., this indicates that the average load factor on the rig was about 26 per cent.

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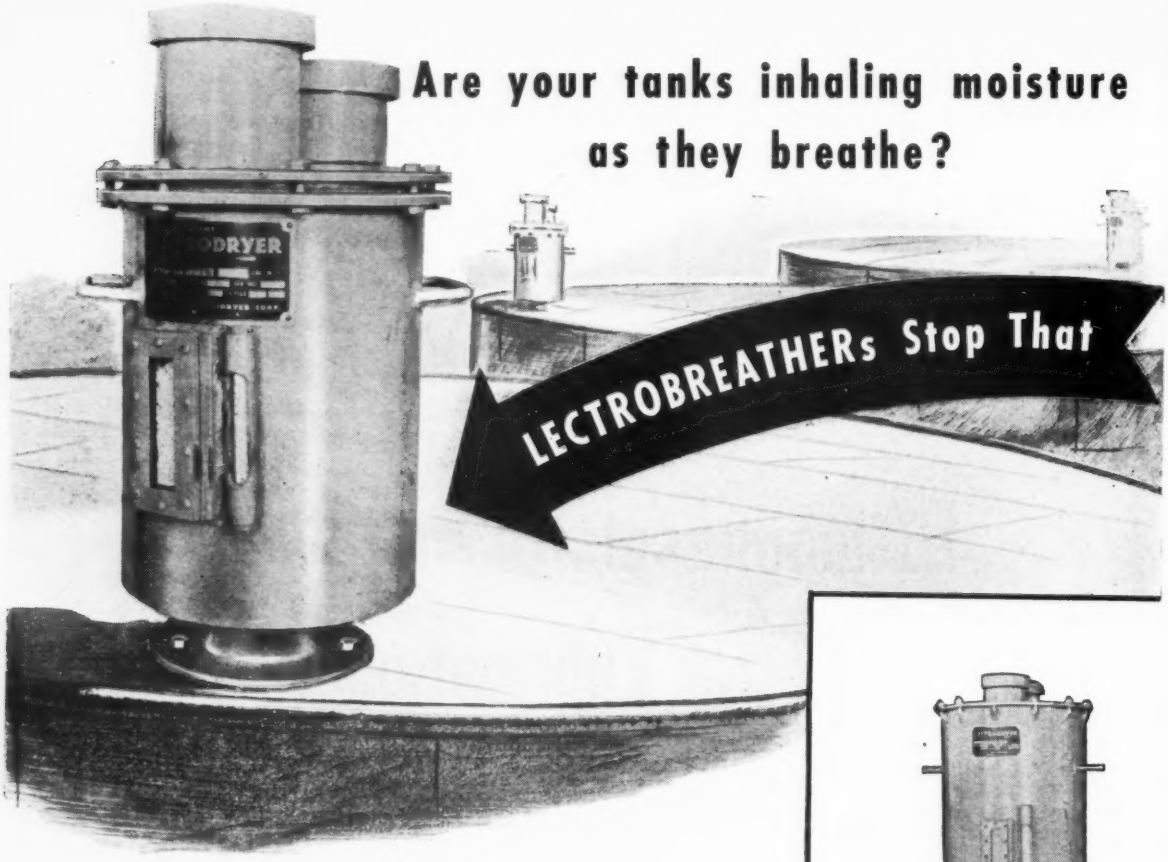

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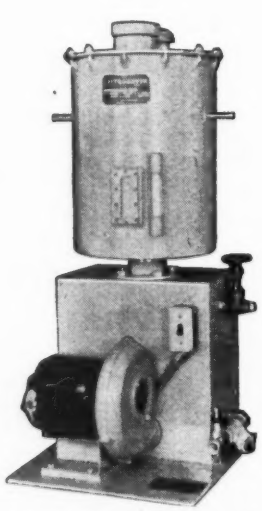

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QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Thermal Conductivity Of Natural Gas

Can you direct us to information on the thermal conductivity of natural gas?—D. L.

Natural gas varies widely in composition and hence it is wise to work with the properties of the gases that compose the natural gas. The weighted average or pseudo thermal conductivity of the gas mixture would be computed from the thermal conductivities of the various hydrocarbons that compose the mixture by multiplying the conductivity by the respective mol or volume fraction of that component in the gas and summing all of the values so obtained.

The Chemical Engineers Handbook by Perry (McGraw-Hill Book Co., Inc., New York) contains the thermal conductivity values shown in Table 1.

These and other data have been studied by D. S. Davis (Ind. Eng. Chem. 33, 675, 1941) and his nomographic charts were used in preparing the figure on this page. Dotted lines indicate extrapolations and no experimental data were available for the dotted portions of the lines.

Example.—For a gas which contains 85 per cent methane, 10 per cent ethane, and 5 per cent of heavier hydrocarbons, the approximate conductivity at 100° F. is:

.85 × .0198	.0168
.10 × .0130	.0013
.05 × .0105	.0005
	.0186

TABLE 1—THERMAL CONDUCTIVITY OF HYDROCARBON GASES

	°C	B.t.u.-ft. / hr.-ft.²-°F.
Acetylene	−75	.0063
	0	.0100
	50	.0130
	100	.0160
Butane (n)	0	.0078
Butane (iso)	0	.0080
Cyclohexane	102	.00948
Ethane	−70	.00665
	−34	.00839
	0	.0104
	100	.0185
Ethylene	−71	.00603
	−50	.00700
	0	.00947
	50	.0122
	100	.0152
Hexane (n)	0	.00595
	20	.00655
Hexylene	0	.00556
	100	.0100
Pentane (n)	0	.00670
	20	.00744
Pentane (iso)	0	.00665
	46	.00879
Propane	0	.0087

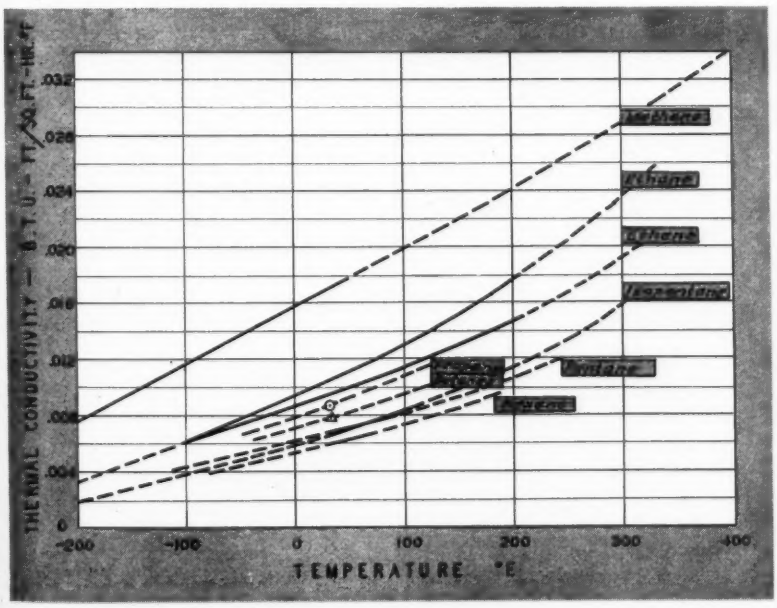


Fig. 1

Heat Content of Natural Gas

From the present data we have available, the properties of natural gas vary all over the map. Since we are more concerned with operations confined to the State of California, we should like to obtain information regarding the specific heat at various temperatures of natural gas.—D. L.

The natural gases of California are probably little different from those found elsewhere, at least with respect to specific heat. Natural gases are handled through such a wide range of pressure that specific heats for atmospheric pressure are of little value, and it has therefore become common practice to work with enthalpy charts. Such charts cannot be reproduced or summarized here but they were published by Dr. George C. Brown in Petroleum Technology (A.I.M.E.), July 1944. The five charts are for gases ranging in specific gravity (referred to air) from 0.6 to 1.0 and they cover a temperature range of 32° to 700° F. and a pressure range of 0.5 to 10,000 psia. They have been republished in several places such as the 1946 Technical Manual of the Natural Gasoline Supply Men's Association (Tulsa) and in the Petroleum Engineer Reference Annual 1945, page 215.

These same references present a chart of specific heat at atmospheric pressure for pure hydrocarbons, several gas mixtures described by molecular weight and gas density, and heavy mixtures ranging in characterization factor from 10.5 to 12.5.

Fuel Consumption of Diesel Engines

What is a proper fuel consumption for our diesel that is operating at about 50 hp.?—F. A. C.

Engines differ in their design and in the efficiency at which they operate. Nevertheless, the specific fuel consumption (pounds fuel per horsepower hour) is governed mainly by the size of the engine and the percentage of full load at which it is operating. Table 1 was obtained by correlating data on various diesel engines and may be used as an approximation.

TABLE 1—SPECIFIC FUEL CONSUMPTION OF DIESEL ENGINES

(Pounds per horsepower hour)

Size, hp.	Full load	Per cent load 80	60	50	40	30	25
50- 60	.45	.46	.48	.50	.55	.64	.69
60- 70	.44	.45	.47	.49	.53	.62	.68
70-100	.43	.44	.45	.48	.52	.61	.66
100-250	.42	.43	.44	.47	.51	.59	.65
250-500	.41	.42	.43	.45	.50	.58	.63
500-3,000	.40	.41	.42	.44	.49	.57	.62

HIGH PRESSURE Pipe Lines

Transport Valuable Helium at 2800 PSI.

These two new lines, totaling some 120 miles, have many special features. They carry helium, worth $10 per M.c.f., for charging into high-pressure tank cars

By Jack J. Reynolds

THE Bureau of Mines has constructed and operated two pipe lines for the transportation of helium at 2,800 psi. pressure in connection with its helium-production activities. In addition to the high operating pressure, the lines are unusual from the standpoints of methods used in construction, stream crossings, testing, and protection against loss of contained helium in case of line failure.

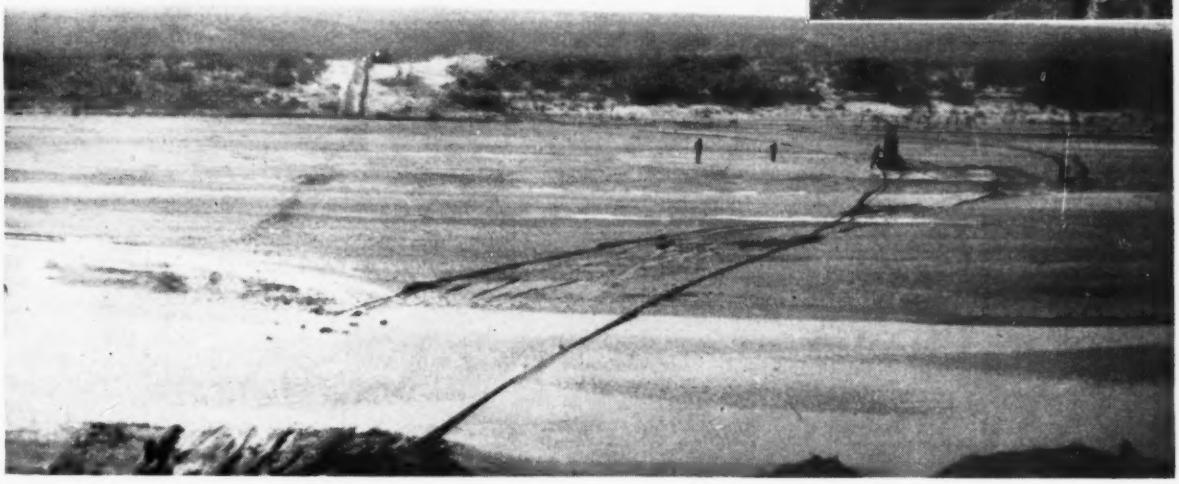
First of the two lines to be constructed was a 90-mile line from the Bureau of Mines Navajo helium plant at Shiprock, N. M., to the nearest standard-gage railroad at Gallup, N. M. Purpose of this line is to transport helium to a point where it can be charged into high-pressure tank cars and small cylinders for shipment. The second line was built from the Bureau of Mines Exell, Texas, helium plant, 35 miles northwest of Amarillo, through the government-owned Cliffside gas field to the Bureau of Mines Amarillo helium plant, 7 miles west of Amarillo. Purpose of this line is to facilitate joint operations of the Amarillo and Exell plants and to permit conservation of helium by its injection and storage in the Cliffside field.

The author, originally from Snyder, Tex., received his petroleum engineering degree from University of Texas in 1941. Between college terms he roughnecked for Carl B. King Drilling Co. He was with Stanolind Oil & Gas Co. before going with the Bureau of Mines in 1942. In 1945-1946 he was in the U. S. Navy. He is now stationed at the Amarillo helium plant as petroleum engineer, in charge of gas-well drilling, gas-field operations, pipe-line operations and construction, and gas measurements.

Pressure welding on the Amarillo-Excell 2-in. helium pipe line

The Exell helium plant, as well as two plants in Kansas and the one at Shiprock, was built by the Bureau of Mines during the war to meet the increased military demand for helium. It extracts helium from natural gas being transported from the Panhandle field to markets in Colorado and Wyoming by Canadian River Gas Co. In 1944 the Navy's requirements for helium began to decline, and, as the helium-bearing gas being produced would otherwise go to fuel markets with subsequent complete loss of the helium, it was decided as a conservation measure to extract the helium and inject the excess over and above market demand into one of the wells in the Cliffside field.

The helium pipe lines were made of 2⅜-in. o.d. extra-heavy seamless-steel pipe. They are coated with a primer solution and 190° F. pipe-line coal-tar enamel and wrapped with asbestos pipe-line felt. The pipe has a



Above: Truss-type bridge on New Mexico 2-in. helium pipe line. Right: Water trough being pulled over Amarillo-Excell pipe line testing for pin-hole leaks under 1,000-psi. gas pressure. Bottom: West crossing of Amarillo-Excell helium pipe line across Canadian River. Line across river is 2-in., cased in 4-in., with annulus filled with cement. Tracks in bed were made by necessary maneuvering of tractor and pipe

20-in. earth cover and is cushioned with sand where rock ditch sections were encountered. All highway and railroad crossings are cased with 4-in. standard line pipe. The coating and wrapping job was tested with a "holiday" tester before the pipe was lowered into the ditch.

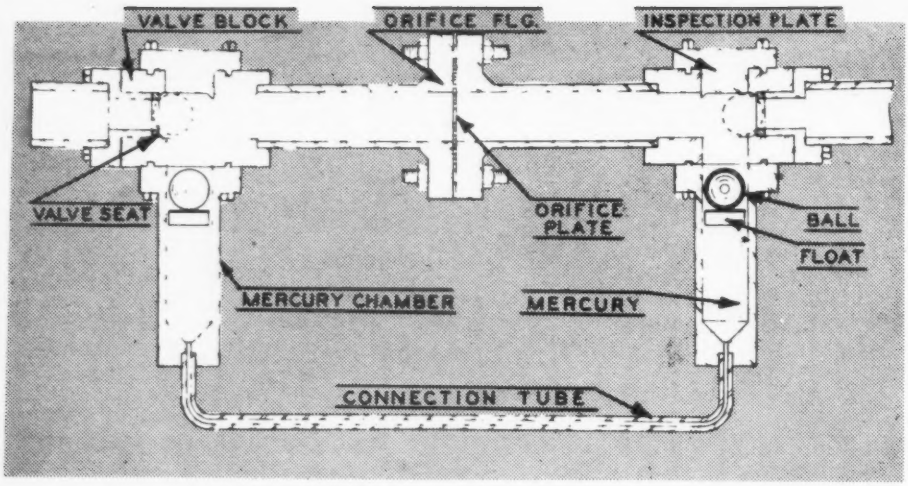
Except for a few tie-in welds, all welding was done by a pressure-heat-fusion method commonly known as pressure welding. This method provided the necessary nonporous, pressure-tight welds so essential for the line. The welds are made by first beveling the ends of the pipe at a 5° angle for welding, cleaning them thoroughly with a buffer, holding the ends by means of clamps, heating the ends with ring type acetylene torches to welding temperature, and then pressing the two pipes together with hydraulic pressure. Each joint was swabbed immediately before it was placed in the line as a precaution against leaving obstructions in the line.

The route of the Amarillo-Exell line was selected from aerial photographs and topographic maps before field examination. Although portions of the route are over rough terrain, no better routing could be found after going into the field. The Shiprock-Gallup line parallels the highway between the two towns.

The total cost of the Amarillo-Exell line was $146,242.77 or $0.881 per foot.

Stream Crossing

Laying the small line across the broad, quicksand-filled bed of the Canadian River was a major problem. It has been reported that for every foot of rise in a stream of this type,



Left: Schematic drawing of working parts of excess flow valve

Below: Schematic drawing showing parts of Amarillo-Excell helium pipe line

there is a sand movement between 3 and 4 ft. in depth, so that a 10-ft. rise—which is not uncommon—would cause sand movement to a depth of 30 to 40 ft. It was recognized that the three essentials of designing an underwater pipe-line crossing are (1) weight to hold the pipe at the bottom of the sand movement, (2) rigidity to resist the sand movement, and (3) sufficient slack to allow the pipe line to settle on bottom for uneven sand movement. The usual manner of adding weight to a river crossing is by installing heavy river clamps, but these do nothing to increase the rigidity and have the disadvantage of catching debris carried by the stream. To give the helium line both increased rigidity and increased weight, the 2-in. pipe was cased with 4-in. standard pipe, and the annular space was filled with a thick cement slurry. The cement slurry was mixed and pumped into the annular space with regular oil-well cementing equipment.

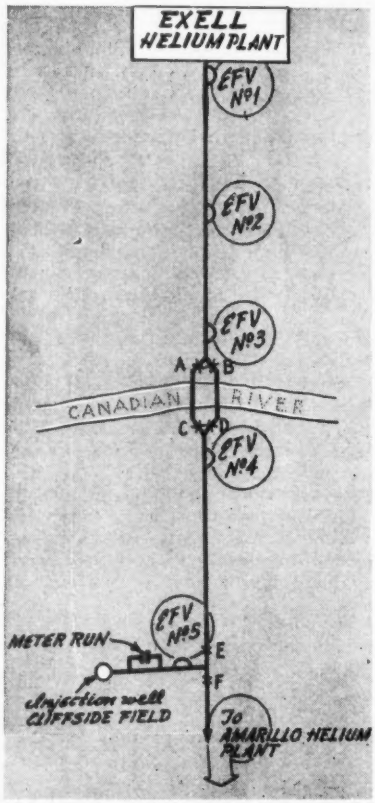
The crossing consisted of two parallel lines about 1,500 ft. in length and 500 ft. apart. Slack was left in the line by making an upstream bend of 175 ft. lateral displacement. Where running water did not interfere, the line was buried beneath the river bed about 18 in. The 4-in. casing extended over the 2-in. pipe line for 125 ft. into the bank on each side of the river. The banks were graded away to permit the pipe to enter the river bed on a gentle slope. The 2-in. pipe was welded together and tested for leaks before the 4-in. casing was slipped over it. The 2 and 4-in. pipes were pulled as a unit across the river by tractors, and the cement was pumped into the annular space after the pipe was in place in the river bottom. The lines were equipped with valves so that either or both branches can be used.

On the Shiprock-Gallup line are a number of steep-sided dry creeks and arroyos, over which it was necessary to construct overhead bridges rather than attempt to lay the pipe line beneath them. A truss-type bridge was selected for these crossings. The top chord of the trusses is made of 4-in. standard line pipe, which also serves as a casing for the 2-in. pipe carrying helium. The 4-in. casing is extended over the 2-in. pipe into the ground on each side, but the bridges are completely supported by the upright members on each end, as there is no stress in the 4-in. casing between the bridge and the ground. All other truss chords are of 3-in. standard pipe or ¾-in. reinforcing rod. Short bridges did not require the side braces. These bridges are of all-welded construction and were assembled from used material on hand.

Testing

Because of the low specific gravity of helium, coefficients for its critical flow are three times that of air and two and one-half times that of most natural gases, indicating that it will escape through openings much faster than those gases. It was necessary, therefore, to conduct tests capable of detecting the smallest leaks in order to be sure that the line was pressure tight. Briefly, the testing was conducted by pressuring the line with natural gas to 2,800 psi., reducing the pressure to 1,000 psi., and submerging the line in water to test for small leaks. As all of the helium produced daily at the Exell plant could leak through a hole in the pipe 1/16-in. in diameter at 2,800 psi. differential pressure, it was necessary to test the entire line as thoroughly as one would test the inner tube of an automobile tire.

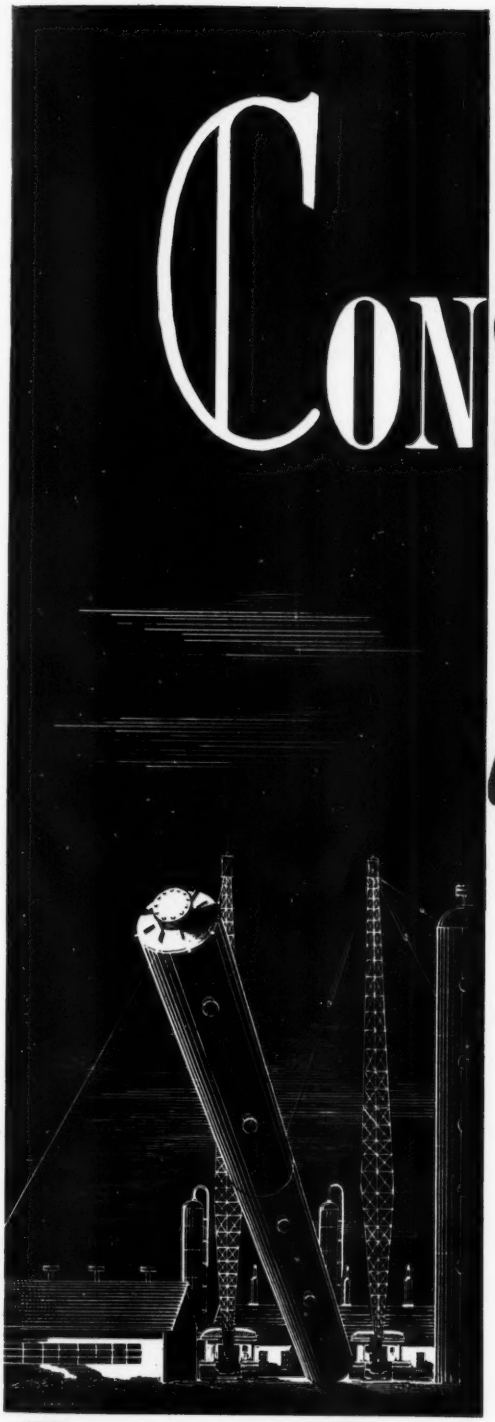
Testing was done on 4-mile sections. Each section was lowered into the ditch as it was welded together, after which it was weighted at intervals throughout its entire length. While in the ditch, the pipe was filled with natural gas at 2,800 psi. from compressors at the Exell plant. At this pressure, a visual inspection was made of the section for leaks, after



which the pressure was released and the pipe placed on skids over the ditch. After satisfactory completion of this test, it was believed safe to handle the line above the ground at lower pressures. While on skids, the line was repressured to 1,000 psi., and a small water-filled trough was placed around the pipe and passed along the entire length of the section.

The trough had expansible rubber glands in each end so that it could be passed over the welds. The trough was approximately 8 in. deep by 8 in. wide by 2 ft. long. Leakage of

(Continued on page 105)



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DIGESTS

A. S. M. E. MEETING, TULSA

THE quick-to-read digests in this special section are of papers presented at the 1946 national conference on petroleum mechanical engineering of the A.S.M.E., held in Tulsa, October 7-9. Spread over the mechanical engineering problems and developments of the petroleum industry, the papers give new information of first-order interest in its many fields. The 37 papers presented at the conference cover, horizontally, the industry from construction materials, equipment, and application—through to production, transportation, and refining.

Some Mechanical Difficulties of High Temperatures Cracking And Suggested Solutions

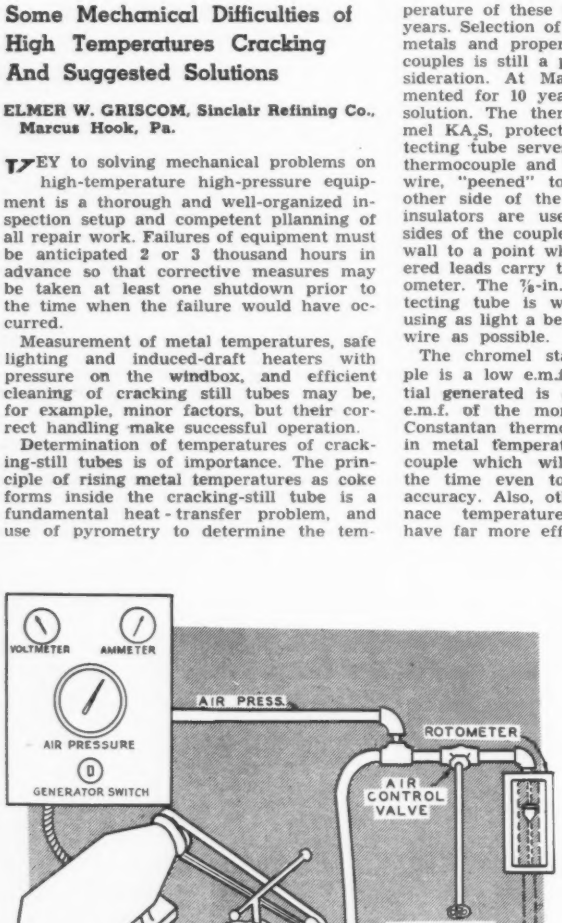
ELMER W. GRISCOM, Sinclair Refining Co., Marcus Hook, Pa.

KEY to solving mechanical problems on high-temperature high-pressure equipment is a thorough and well-organized inspection setup and competent planning of all repair work. Failures of equipment must be anticipated 2 or 3 thousand hours in advance so that corrective measures may be taken at least one shutdown prior to the time when the failure would have occurred.

Measurement of metal temperatures, safe lighting and induced-draft heaters with pressure on the windbox, and efficient cleaning of cracking still tubes may be, for example, minor factors, but their correct handling make successful operation.

Determination of temperatures of cracking-still tubes is of importance. The principle of rising metal temperatures as coke forms inside the cracking-still tube is a fundamental heat-transfer problem, and use of pyrometry to determine the temperature of these tubes has been used for years. Selection of the best combination of metals and proper application of thermocouples is still a problem warranting consideration. At Marcus Hook, we experimented for 10 years before we found the solution. The thermocouple used is chromel KA,S, protecting-tube type. The protecting tube serves as one element of the thermocouple and the No. 8 gage chromel wire, "peened" to the tube, acts as the other side of the couple. Porcelain bead insulators are used to separate the two sides of the couple out through the heater wall to a point where 14-gage rubber covered leads carry the e.m.f. to the potentiometer. The ⅞-in. o.d. stainless steel protecting tube is welded to the still tube, using as light a bead of 25-20 stainless steel wire as possible.

The chromel stainless steel thermocouple is a low e.m.f. couple and the potential generated is only about one-half the e.m.f. of the more generally used Iron-Constantan thermocouple. Important point in metal temperature work is to have a couple which will be in service all of the time even to the sacrifice of some accuracy. Also, other factors such as furnace temperatures, flame impingement, have far more effect on the reading than the low e.m.f. characteristic of this type couple. We have not had a cracking-still tube failure during the 5 years that these couples have been in service and the life of the couple has been beyond all expectations.



Pneumatic tube-cleaning tools are essentially small gas turbines having all of the characteristics of a velocity-type water turbine or gas turbine. The parts are very rugged, but even with the best of lubrication and care, they will wear and lose their efficiency. There is no way to determine whether the turbine is running at maximum r.p.m. and delivering rated horsepower with minimum air consumption. Considerable testing over a number of years was done in an effort to improve "check-tests." Tests with a prony-brake setup were inconsistent and difficult to evaluate.

Fitting the turbine to absorb the power with an electric generator proved very satisfactory and the results consistent (see cut). The test can be run with inexperienced help and as many as 20 cleaning motors of the same type and size can be tested in 1 hour by one man. Plant air is fed through a rotometer and a control valve to the motor. The generator is loaded to a predetermined amperage dependent on the size of the air motor being tested

The Design of Pressure Vessels for High-Temperature, High-Pressure Reactor Service

E. W. JACOBSON and B. M. WEDNER, Gulf Research & Development Co., Pittsburgh, and T. G. BECKWITH, University of Pittsburgh.

IN the design of pressure vessels for high-temperature, high-pressure reactor service there are many conditions encountered for which the A.S.M.E. Boiler Code does not specifically provide a guide. Therefore the designer must rely on past experience and follow sound engineering principles. These may be summarized as follows:

1. Theoretical basis for determining the wall thickness of the vessel should depend on the service to be encountered For conditions involving steady temperatures and pressures code maximum stress formula should suffice; where cyclic or varying pressure and/or temperature conditions are encountered the maximum strain formula should be used.

2. Materials must be carefully selected in order to obtain the maximum safety and economy.

3. Creep strength, differential expansion, and thermal stresses must be given careful consideration.

4. Good engineering practice must be followed.

5. Selection of the type of closure will be determined by the size and service of the vessel. Every part of the closure requires intensive design consideration with regard to kind of material, thermal expansion properties, unit stresses, and tightening practice.

Controlled Directional Drilling of Wells

G. L. KOTHNY, Sperry-Sun Well Surveying Co., Philadelphia.

FACTORS essential for successful controlled directional drilling are:

1. Use of oil-well-surveying instruments and correct interpolation of the information obtained.

2. Accurate methods of orientation of the deflecting tool underground.

For the first factor, there is the multishot directional surveying instrument which determines the actual course of the bore hole, and the single-shot instrument which is used at regular depth intervals.

Three methods of orientation are in general use:

Drill-stem orientation, used mostly during the early period of controlled drilling It is accurate in vertical holes or in holes inclining in one vertical plane. Holes which spiral or dog leg may greatly affect the readings of direction.

Indirect method of orientation, which requires knowledge of the direction and inclination of the hole at point at which deflection is intended. This is usually obtained from a preliminary multishot survey. Since direction of the inclination is known from the preliminary multishot survey, actual position of the deflecting tool at bottom of the hole can easily be determined from the record.

Direct method of orientation uses a nonmagnetic sub, 14 to 16 ft. in length, which contains two small magnets and provisions for seating a directional single-shot instrument in which the inclination unit has been temporarily replaced by a second compass unit. The drilling assembly is lowered into the hole and when the deflecting tool reaches the bottom and prior to setting it, a single-shot record is made. Actual position of the deflecting tool underground is determined from the data. Knowing the actual position of the deflecting tool at the bottom of the hole, the angle necessary to turn it into the desired position is easily determined. The drill pipe is then spudded to relieve it of any torsional stress and then rotated to bring the tool in the desired position. After this has been done, another single-shot record is taken to obtain a photographic record of final position of the deflecting tool before setting it and proceeding with the drilling.

Principal deflecting tools are: (1) The whipstock, (2) knuckle joints, (3) spudding bits, and (4) nonmagnetic drill collars.

The paper further discusses a number of successfully accomplished controlled directional drilling operations in Gulf Coast and California oil fields and the possibilities of increased oil recovery from piercement-type salt domes and offshore or inaccessible locations.

Mid-Continent Mud Conditioning

G. C. MacDONALD, Gulf Oil Corp., Tulsa.

IF wells are to be drilled deeper and deeper, the physical and chemical properties of the drilling mud must be more surely controlled. It is the reaction of the drilled hole to those mud physical and chemical properties that is important and determines the relative value in a given barrel of mud. Since the Mid-Continent average mud expenditure per well may not warrant the continued presence of a mud engineer on the rig, possibly as much as 70 to 80 per cent of the conditioning work is under direct supervision of the drilling crew. Detailed mud analyses are not possible with the equipment and personnel at the average rig in the area, yet mud conditioning must be performed. Lacking such a man on routine Mid-Continent drilling wells, it is necessary for the operator and drilling contractor to consider more factors in the plans for a given well. Some of these are:

1. **Water supply.**—Most operators and responsible mud companies have facilities for water analysis and if the prospective water supplies are first examined, need for extensive treatment of highly mineralized makeup water may be eliminated.

2. **Casing program.**—The program should be designed to exclude salt or salt water and to hold up the red beds in the event lost circulation is expected below.

3. **Geological information.**—Most Mid-Continent drillers know what caliber mud is needed to penetrate successfully certain troublesome formations. What they cannot know unless told in a new area, is where to expect such formations. The drilling personnel should have information also on expected gas-bearing or lost-circulation beds.

4. **Testing.**—Probable depths of cores, drill-stem tests, and electric logs should be known by the drilling personnel in advance so that the hole will be in condition.

5. **Equipment.**—On a power rig, the pump and engine should be of adequate capacity. It will require 45 per cent more fluid in a 9-in. hole than it will in a 7⅞-in. hole to develop the same upward velocity of the mud between drill pipe and hole. The horsepower requirements might increase as much as 145 per cent. Lacking adequate annular velocities, the drilling crew might be unable to maintain a mud which would keep the hole clean.

Asphalts and Their Evaluation For Commercial Use

J. C. ROEDIGER, Standard Oil Development Co., Elizabeth, N. J.

IN 1941, total asphalt consumption in the United States was close to 7 million tons, with 90 per cent produced from petroleum by refining (see Table 1). Largest consumption was in asphalt paving construction, accounting for 4,576,000 tons or 66 per cent of total production. The roofing industry was next with 1,671,000 tons (24 per cent), and waterproofing followed with 44,900 tons (0.6 per cent). This tabulation shows only a few of the products utilizing asphalt. Many other applications can be included.

Chemically, asphalt is a thermoplastic mixture of high-molecular-weight hydrocarbons with small amounts of sulfur, nitrogen, and oxygen compounds. The colloid chemist has provided certain concepts which align themselves fairly well with the physical properties of asphalts.

The majority of asphalt in this country is produced by flash distillation under high vacuum, using selected crudes as the start-

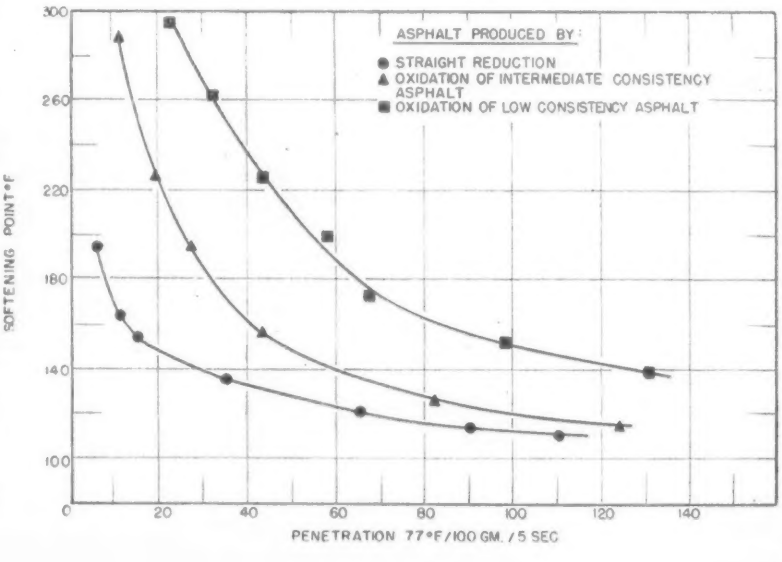
TABLE 1—U. S. DOMESTIC CONSUMPTION OF ASPHALT—YEAR 1941*

	Major use	Tonnage	
1. **Native asphalts:**			
Bituminous rock	Paving	654,700	
Wurtzilite	Paints, coatings	36,400	
Grahamite (Cuba)	Paints, coatings	†2,800	
Trinidad Lake asphalt	Paving	†6,000	
Total native asphalt			699,900
2. **Petroleum asphalts:**			
All types	Paving	‡3,830,100	
All types	Roofing	1,671,700	
All types	Waterproofing	44,900	
Solid and semisolid	Rubber blending	20,500	
Solid and semisolid	Briquetting	77,200	
Solid and semisolid	Mastic and mastic cake	11,900	
Solid and semisolid	Pipe coating	41,900	
Solid and semisolid	Molding compounds	31,900	
Solid and semisolid	Miscellaneous	248,100	
Semisolid and liquid	Emulsified asp. and fluxes	129,000	
Semisolid and liquid	Paints, enamels, japans	45,000	
Semisolid and liquid	Miscellaneous	42,300	
Semisolid and liquid	Road oils (paving)	35,300	
Total petroleum asphalts			6,283,000
Total U. S. consumption, 1941			6,982,900

*Minerals Handbooks 1941 (Figures taken to nearest 100 tons). †Figures for first three quarters of 1941. ‡Includes 1,503,130 tons of cutback asphalts.

TABLE 2—EFFECT OF OXIDATION ON ASPHALT PLIABILITY AND IMPACT

Asphalt produced by:	Straight reduction	Oxidation from Intermediate flux		Oxidation from Asphalt of low consistency	
S.P. °F. (R&B)	195	195	220	195	220
Pen. 77° F./100g/5"	6	27	21	57	46
Pliability, in degrees at 0° F.	0	50	...	180	...
Impact, in ins. at 40° F.	0	...	3.3	...	11.0



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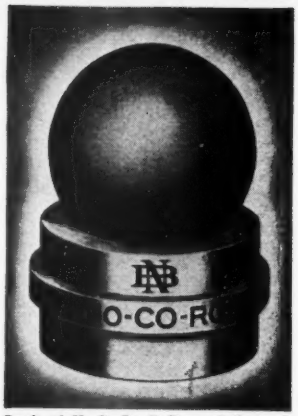

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ing material. However, asphalts are produced by other methods which include: (a) blending; (b) solvent separation; (c) oxidation.

The oxidation process can be varied to produce different kinds of asphalts. The improvement obtained by oxidation and variation possible by changing the consistency of the asphalt base used as the starting material is illustrated. Similarly, the low-temperature pliability and impact resistance are considerably enhanced as shown in Table 2.

Major asphalt properties are: Consistency; susceptibility to temperature change; flash point; volatility; specific gravity; ductility; solubility; weathering characteristics; stain; shock resistance; and pliability.

Equipment for Low-Cost Oxygen Production

F. J. JENNY, Hydrocarbon Research, Inc., New York City, and M. J. CONWAY, Stacey Dresser Engineering, Cleveland.

THERE are two general commercial methods for production of oxygen: (1) electrolysis of water, and (2) fractionation of air. The first is of importance when producing a pure hydrogen stream in addition to the oxygen stream. Where the production of oxygen is the primary objective, the second method is almost invariably used. There also is the method of extracting oxygen from air by chemical means, but at the present time this has been limited to small-scale operations.

Production of oxygen by the liquefaction and fractionation of air requires very exacting standards relative to the engineering design of equipment and in the application of control instruments. In the fractionation process, it is necessary to pay special attention to argon only when relatively high purities are specified for the oxygen and nitrogen streams. To remove argon from these product streams, additional fractionation equipment is required. Special provision must be made in the liquefaction process for the removal of carbon dioxide, water vapor, and dust.

With the exception of the relative size of apparatus required to handle the larger quantities of air, the description of a pilot plant which was in operation for 2 years at Olean, N. Y., will suffice to demonstrate the type of process design used in the large-size commercial units. The unit operations involved consist essentially of compression, heat exchange, refrigeration, and fractionation.

Filtered to remove mechanical impurities, the air is compressed to 85 psig. in two stages. The compressed air is cooled directly against waste nitrogen and oxygen in a multiannulus reversing exchanger which not only cools but also purifies the air without the necessity of chemicals. After the air leaves the exchanger, it is discharged into a surge drum at approximately —250° F. where the main portion, about 70 per cent, of the air passes directly from the surge drum to be further cooled by exchange against the waste nitrogen before entering the high-pressure column. The remaining 30 per cent is used to provide refrigeration by expanding the high-pressure air through an engine. This expansion engine does work by compressing an auxiliary air stream, and the heat content of the expanded air is decreased by the work of compression. Inlet temperature of the air to the expander is controlled at —250° F. Work output of the expander is controlled by throttling the air at the outlet of the compressor before releasing it to the atmosphere.

The cooled high-pressure air enters the tower below its bottom tray. This inlet section of the tower contains 20 trays and separates the air into an overhead liquid nitrogen product of low oxygen content, and a bottom liquid product containing 35 per cent oxygen.

The nitrogen liquid is subcooled by exchange against the waste nitrogen and supplies reflux to the upper section of the fractionating column where it is introduced on the top tray. This section of the column, which contains 40 trays, operates at 10 psig. The enriched oxygen product from the bottom of the high-pressure column is similarly cooled and then introduced into the low-pressure column as intermediate reflux. The expanded air also is introduced into the low-pressure column at an intermediate point.

The low-pressure tower fractionates the feeds into a waste nitrogen stream which is removed as an overhead vapor and an oxygen product which is withdrawn from below the bottom tray, also as a vapor. The reboiler duty is supplied by the condensation of the overhead vapors in the high-pressure section, part of which are withdrawn for reflux to the low-pressure section and the balance pass down through the high-pressure section as reflux.

The oxygen product passes from the low-pressure section of the fractionating tower directly to the inner annulus of the reversing exchanger tubes where its refrigeration is recovered, but its course is not affected by the reversal of the high-pressure air and waste nitrogen. The oxygen then enters the service lines and may be subsequently compressed to suit service conditions.

The first of two large plants is now under construction at Brownsville, Tex., which will operate in connection with the Hydrocol process for the processing of natural gas to produce motor fuel, diesel oil, and crude alcohols. The second unit, to be built for a major oil company, also will supply oxygen for a Hydrocol plant similar in size and operation to the Brownsville plant. These two plants will compress approximately 250 million cubic feet per day of air to 75-85 psig.

Recovery of Barite From Rotary Drilling Mud by Centrifugal Separation

CHARLES A. LINDSAY, Merco Centrifugal Co., San Francisco.

THE continuous type of centrifuge described here operates with a continuous feed and a continuous discharge of separated products. First successful application of this centrifuge was in the rotary-drilling industry for extracting sand and cuttings from rotary-drilling mud, and more recently it has been used by that industry for weight-material recovery and mud conditioning (see cut).

By the simple expedient of fresh water dilution to reduce the viscosity and decrease the gel strength, drilling mud can be conditioned for centrifuging after the cuttings and + 200-mesh sands have been removed. The centrifugal operation consists in separating barite as a heavy concentrate and rejecting lightened mud containing slimes and contaminating fractions. Efficiency of this separation is from 85 to 95 per cent recovery of the weighting material.

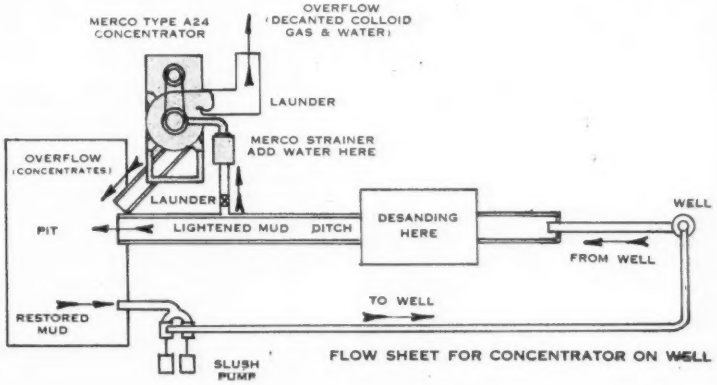
The rotor of the centrifugal concentrator is the only part subjected to movement. Mud is fed into the feed well, drops through a pipe to the feed impeller, where it picks up rotation from the vanes of the impeller. The feed is discharged through a peripheral opening into a separating chamber, filling it. Overflow occurs at a lip, with the overflowing mud, as waste, leaving the machine through a port. The centrifugal force on the material being treated settles out the solids, and they accumulate at the periphery of the rotor in pockets. These terminate in nozzles. The fluid containing the concentrates is discharged out of the nozzles as underflow. This accumulates in a bottom section and is pumped back into the rotor by a conical pump. The recirculation of the underflow slurry is called the return, and it automatically augments the feed, keeps the mouths of the nozzles from becoming packed with solids, and permits discharge from the machine without excessive amounts of liquid.

Generalized flow sheets and operating setups are described, and detailed results are given showing mud weight, specific gravity of mud and solids and per cent barite. Sand contents of the concentrates are tabulated and discussed. The general properties of the concentrate in the light of those properties desirable in drilling muds are detailed.

In the large-size self-cleaning filters the scrapers are stationary and the filter cylinders revolve, whereas in the smaller unit the cylinder is stationary and the scraper rotates. In both cases the principle of operation is the same, that is, the oil is pumped from the outside through to the inside of the filter cylinder. As the dirt content builds up on the exterior surface of the cylinders, naturally the differential pressure is increased and when this reaches a predetermined point a differential pressure switch cuts in the motor driving the scrapers or cylinders and the cleaning action is accomplished.

On the market during the past year is a filtering element constructed of sheet cellulose impregnated with neutral synthetic phenol resin. These sheets are wound to a certain thickness into cylinders and baked. These elements are rigid and will withstand several hundred pounds differential pressure and will not disintegrate in either oil or water, will withstand ordinary filtering temperatures.

Very satisfactory results are being obtained on turbine oil bypass filter systems



FLOW SHEET FOR CONCENTRATOR ON WELL

using continuous gravity-type filters with automatic water separators plus the cellulose cartridge polishing filter.

Rotary Pumps in Oil-Field Service

R. J. S. PIGOTT, Gulf Research & Development Co., Pittsburgh.

PERFORMANCE curves obtained on a variety of rotary pump designs show peak efficiencies varied from 51 to over 80 per cent. Spur and helical gear forms show the lowest efficiency, and from extensive investigations during the war, improvement does not appear feasible. For low-pressure, low-cost rotaries, comprising two-and-three-tooth-difference internal gear, swinging vane and lobular, the efficiencies reach 70 per cent at 200 g.p.m. and thereafter gain little with size. The high-pressure rotaries, one-tooth-difference internal gear, and the three screw, show 70 per cent at 100 g.p.m., and improve further in the larger sizes. Some of the larger low-pressure lobular and internal gear pumps show efficiencies usually as high as the high-pressure pumps.

Life of rotary pumps is not as great as that of reciprocating pumps, and therefore selection becomes strictly an economic problem. There is almost no reliable statistical information on life of rotary pumps, but our own life tests showed that a low-pressure, low-cost internal-gear rotary lasted the equivalent of about 1 year's normal load factor service, running at rated pressure of 100 psi. on clean water. A high-pressure, more expensive internal-gear rotary has lasted over 6 years on crude oil at 600 psi. The difference lies in materials, workmanship, and general design. The chief item of failure in the low-pressure pump was rotors, a main cost item; in the high-pressure pump, largely rolling bearings.

A number of steam-jacketed rotaries have been developed for very viscous materials. The rotary pump is very easily adapted to jacketing on account of the relatively simple compact shapes.

No rotary pump has yet been built in both the pressure (600 to 1,000 psi.) and the capacity (25,000 bbl. per day and over) ranges for main pipe-line services. However, with the two or three designs that are inherently suitable for high-pressure service, rotary pumps for pipe-line operation are not out of reason.

Centrifugal Purification

COLBY W. BRYDEN, DeLaval Separator Co., New York.

IMPROVEMENTS made recently in lubricating oils raise new problems regarding protection of equipment. With modern additive oils the primary function of centrifugal purification is once again the protection of the turbine, diesel engine, or transformer from the standpoint of preventive maintenance.

In selecting the right size and type of centrifugal purifier the completeness of separation required for the particular problem should be considered and a yardstick of performance, or standard performance guarantees, should be considered in addition to the recommended capacity for the amount of oil or the size of the apparatus. Special problems sometimes require combinations of equipment such as centrifugal purifier and filter, chemical treatments, etc.

Turbine lubrication.—Good oxidation-inhibited turbine lubricating oils may last 70,000 to 100,000 hours and with them formation of oxidation products is greatly reduced. Keeping these oils free from water and solid matter is still essential to continuous economical turbine operation and should be done without removing inhibitors. Continuous centrifugal purification is considered necessary by many utility operators, and the additional use of a polishing filter for removal of extremely small low-density particles may be advantageous.

Diesel lubricating oil.—Most of the detergent oils currently recommended for high-speed diesel lubrication cannot be filtered visibly clean, and, as known for years, the fine carbon particles are not harmful so long as the concentration of particles does not get too high. It is still important to remove continuously both abrasive metallic and dust particles from the oil—and the water where present—without removing the detergents, and to remove carbon which coagulates and deposits when the detergents are used up. Centrifugal purification is effective in removing such foreign materials which are the cause of engine wear and costly overhauls, and the use of detergent oils keeps the interior engine surfaces clean.

Centrifuging Heavy Fuel Oil

Diesel fuel oil.—The need for centrifuging heavy fuel oils and the resulting saving in engine wear has long been recognized. The burning of light crude oil from the pipe lines in pumping-station diesel engines has resulted in developing a new technique of purification to discharge continuously the considerable amount of wax which must be removed from these oils. Even light distillates, which are clean when they leave the refinery, may pick up abrasive solids and sometimes water during transit and storage.

Insulating oil.—Improvements in the design of transformers and circuit breakers, as well as improvements in the oils, have somewhat simplified the problems of maintaining transformers and circuit breakers in continuous operation. It is still essential to remove the last traces of free water in order to maintain the required dielectric strength of the oil and protect the windings of the transformers. The problem of water in solution in the oil is receiving careful study as well as many other factors affecting the condition of the oil and its effect on the transformers themselves.

Trends in Surface Pumping Equipment Design

E. M. FETZER, The Continental Supply Co., Dallas.

DYNAMOMETER cards of pumping wells and observation of equipment in operation reveal a peculiar type of loading not found elsewhere in any industry. There are loads which can vary from zero to several thousand pounds in a fraction of a second, a thousand or more times an hour. A volative effort is required to move this load that may vary from zero, or even a negative value, to a maximum with twice the frequency of the load cycle.

Where comparatively short pitmans and short walking beams are associated with a given stroke length, the larger is the angle through which these members must operate in a complete stroke cycle, and the more severe are the unnecessary forces that operate at the walking-beam center bearing. These forces produce a moment which is transmitted to the main base, causing that member in turn to breathe or flex upon the foundation. With short members in the pumper structure, a higher peak torque and turning effort is required for the same polished-rod load as compared to those having better geometry. The greater demand upon reducers, drives, and prime movers can materially affect the service these parts render. The time interval between peak velocities becomes more unequal as shorter members are used.

Shock loads undoubtedly will always be present in varying degrees with conventional sucker-rod pumping, and pumping equipment will be required to withstand the demands made upon it to its full rated capacity. The adverse effect can be reduced, however, by providing a better geometry for the pumper structure and sufficient stability or rigidity in the assembly consistent with the best possible adjustment of the equipment to operating conditions.

Present specifications on unit pumpers give stress as the limiting consideration and set no limit on deflections. If a pinion can deflect several thousandths of an inch when a shock load impinges upon it, manufacturing tolerances within the limits of one thousandths of an inch are rendered useless since the mating parts are no longer in their intended positions.

Beyond the improvements possible by providing good geometry and rigid structure, the operator can often reduce the shock loads by proper attention to operating conditions such as pumping speed, stroke length, counterbalance effect, pump plunger, and sucker-rod combinations.

The amount of stored energy in the flywheel of a pumping engine has a pronounced effect upon its own operation. Engines having insufficient flywheel effect are found to vary as much as 40 per cent in speed during the pumping cycle. A large engine flywheel has another advantage: its greater mass inertia lowers the tuning or vibration frequency of the pumping system. Interesting possibilities also are offered by the application of a flywheel to electric motors used for oil-well pumping.

Development in Side-Wall Coring by the Rotary Method

J. R. YANCEY, A-1 Bit & Tool Co., Houston.

SIDE-WALL coring in rotary drilling uses a floating whipstock carried by the drill pipe. A core barrel passes down through the drill pipe and is deflected into the side wall of the well bore by the whipstock. Torque is transmitted to the core cutter by the drill pipe. Feed is controlled by hydraulic pressure. The core barrel and cutter are retrieved with a wire-line overshot.

Cores are obtained by this method from hard as well as soft formation. These cores are 1¼ in. in diameter and have sufficient volume to allow complete analysis. Statistical records of this new tool for guiding petroleum geologists and engineers through fast and economical coring operations at desired depths and times are:

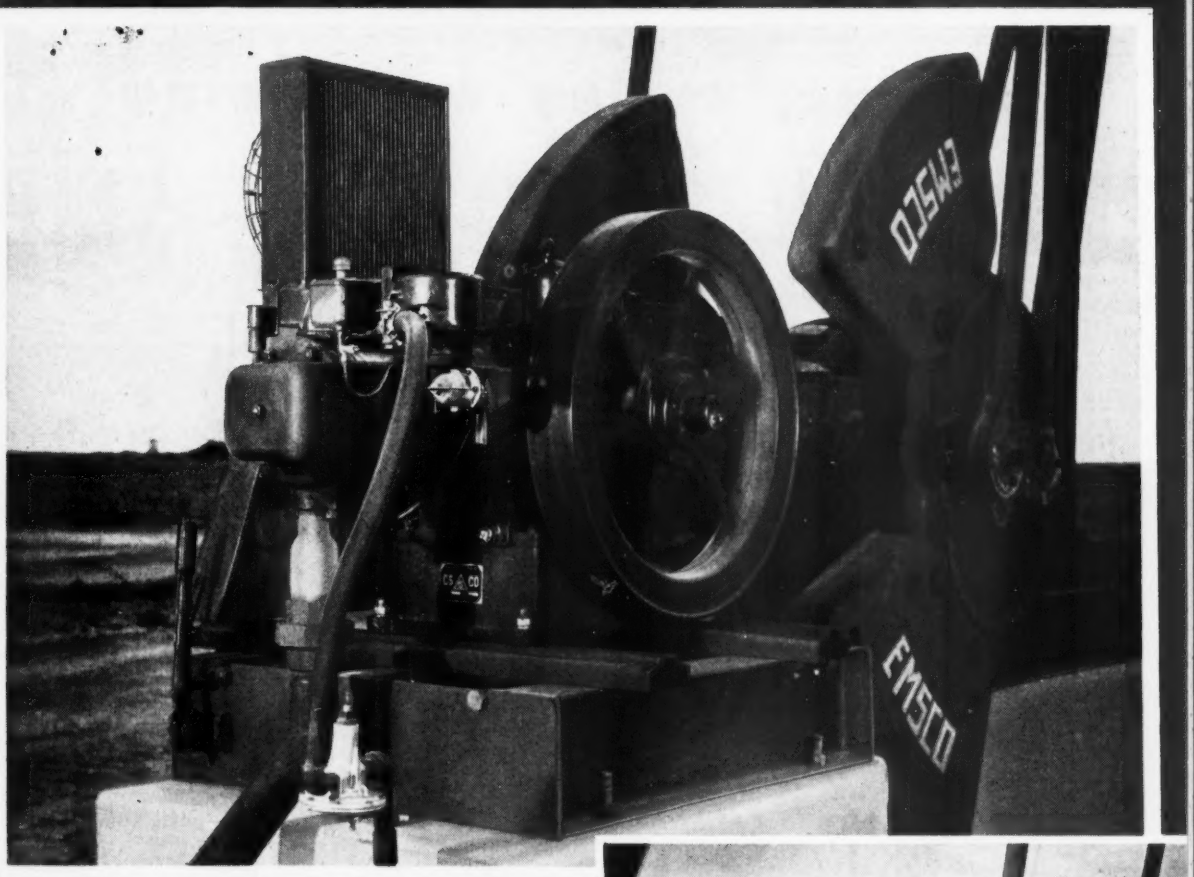
TYPE FORMATIONS CORED

Type formation	No. of cores cut	Average recovery
Sand	843	6.1″
Lime	70	4.7″
Misc.	20	8.3″

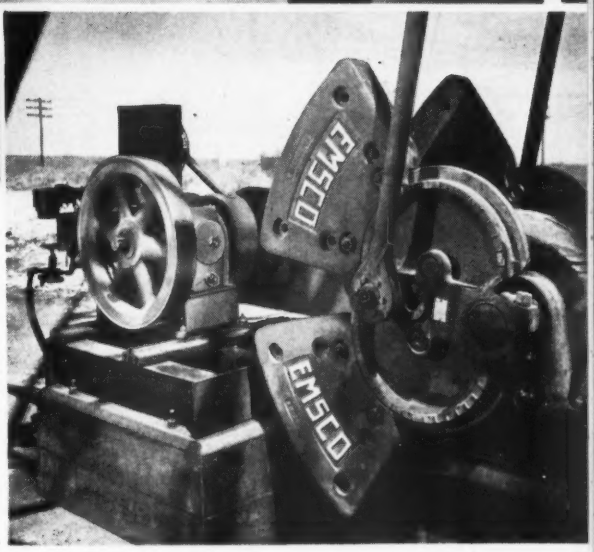
CORES CUT FROM DECEMBER 17, 1945, THROUGH AUGUST 20, 1946

Companies using A-1 barrel	Number jobs completed	Number cores attempted	Number cores recovered	Average recovery	Number formations cores
47	110	1,158	933	6.35″	29

Just Crank it...AND IT GOES!



CSCO-66 Pumping Engine



Operators who have handled a CSCO-66 appreciate its easy starting features and, when started, its ability to give 24-hour service at top RPM.

- Accessible positive compression release—*for easy starting.*
- Twin disc clutch power take-off; roller or anti-friction clutch shaft bearing—*no drag.*
- Properly cooled spark plug—*does not foul.*
- Adequately cooled valves—*do not burn up.*
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Save drilling time and protect your drill pipe, casing and tubing with

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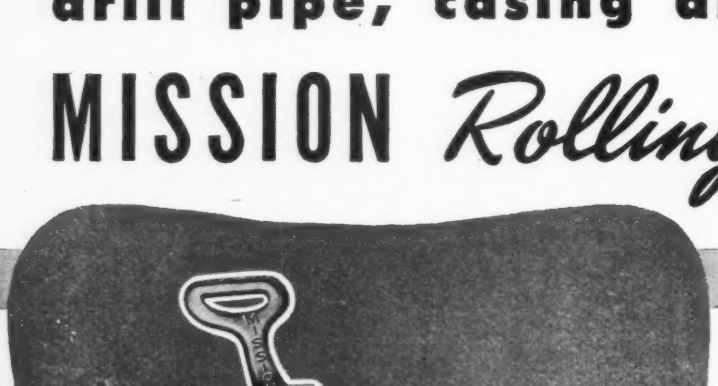

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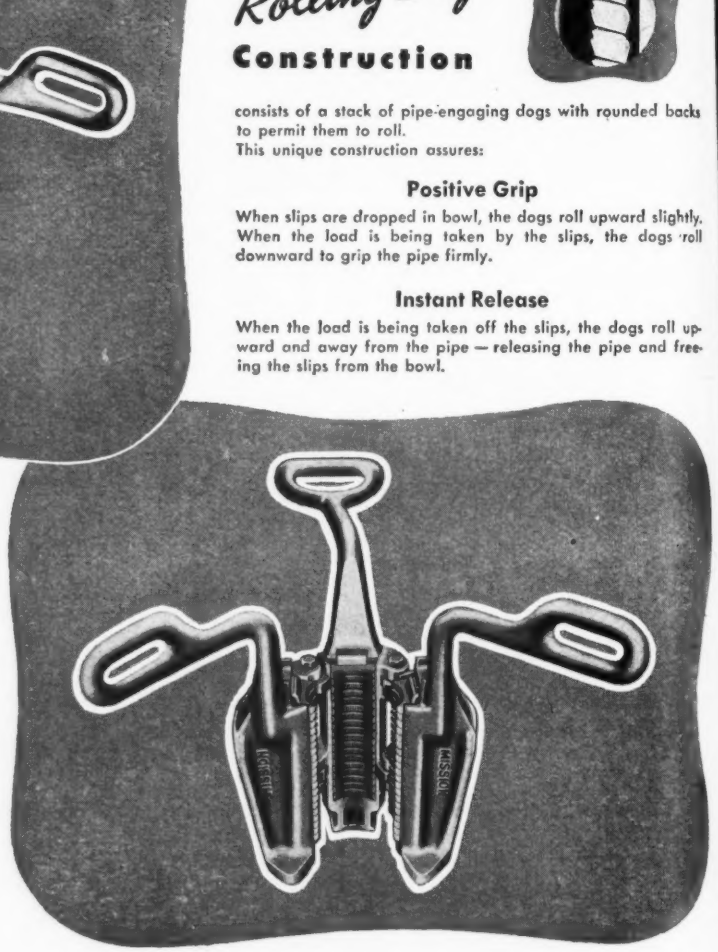
This unique construction assures:

Positive Grip

When slips are dropped in bowl, the dogs roll upward slightly. When the load is being taken by the slips, the dogs roll downward to grip the pipe firmly.

Instant Release

When the load is being taken off the slips, the dogs roll upward and away from the pipe — releasing the pipe and freeing the slips from the bowl.



The positive gripping and instant releasing due to Mission's rolling dog construction means: No coaxing the slips to take hold. No struggling to get them to release. **Assures safer, faster round trips.**

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Factors Influencing the Selection of Equipment For Artificial Lift

J. H. FIELD, Sohio Petroleum Co., Oklahoma City.

SELECTION of equipment for artificial lift is an engineering problem that requires all factors, including reservoir performance, to be analyzed before equipment is selected. Goal should be that equipment which produces the required amount of fluid at the least cost and with minimum of operating difficulties. However, one particular method may be the most economical during the flush-production period, another more economical later on, due to changing reservoir characteristics, such as lowering of fluid levels, increases in water production, changes in gas-oil ratios, etc. Thus, the selection finally may be the installation which results in the greatest net profits over the life of the pool. Factors considered in determining the most economical method are: (1) Initial investment, (2) operating expense of equipment, (3) salvage value of equipment, and (4) economic life of the wells.

Artificial-lift methods are: (A) Sucker rods with conventional type pumping unit, (B) Hydraulic system, (C) Submersible centrifugal pump, (D) Flow valves, (E) Sucker-rod pump with hydraulic head, (F) Sucker rods with rod-line power. The relative advantages and disadvantages of each of these methods are outlined; however, the author points out that these factors are in the nature of guides, and that each method in certain cases is better adapted than any other method.

On sucker-rod pumping, procedure for selection of equipment first is to determine the bore of pump that is necessary to produce the required amount of fluid, using a pump efficiency of approximately 75 per cent for most wells. Knowing the bore of the pump and the maximum fluid production to be handled per day, the peak polished-rod load is determined, based on Mills formula, as follows:

$$P = W_o + W_r \left(1 + \frac{LN}{70{,}500}\right)$$

Where

P = Polished-rod load, pounds.
W_o = Weight of fluid, pounds.
W_r = Dry weight of rods.
L = Length of strokes in inches.
N = Number of strokes per minute.

If there are other pumping wells in the pool, the maximum polished-rod load may be determined by dynamometer tests. However, it should be fully understood that dynamometer tests are meaningless as far as equipment selection for other wells is concerned unless the wells being weighed are operating under maximum conditions.

Sucker-rod selection is on the basis of the maximum load to be handled and on the corrosive nature of the fluid produced. In areas where a portion of the wells pump corrosive fluid, some operators have adopted the policy of using only the one grade of rod in that area rather than using a particular rod for corrosive wells and a second type rod for the noncorrosive wells. In the selection of sucker rods for deep wells, the decision must be made on what size of rods is to be used and if a tapered string should be run. If a tapered string is employed, it is the belief of some that any failure of the rods near the top of the string will result in corkscrewing of the smaller-diameter rods at the bottom of the well. It has been found from experience that there is no answer to whether rods will corkscrew if the string fails near the top, but it is a known fact that the corkscrewing of rods will, to a certain degree, be dependent on the size of tubing. In an effort to reduce damage to rods following failure, some operators use oversize couplings for the smaller-diameter rods with much success.

The different basic types of sucker-rod pumps, tubing catchers, advantages of standardization, and operation of equipment are discussed.

Suspended Wall Linings for Catalytic Regenerators And T. C. C. Kilns

H. O. JOHANSON, M. O. Detrick Co., Tulsa.

NO suspended wall in either the fluid catalytic regenerators or T. C. C. kilns has ever been replaced by any other type of lining but a few of the monolithic linings have been replaced by suspended-wall constructions.

Greatest advantage to the suspended wall is that all tile is definitely locked in place by mechanical means so there is no possibility of it becoming loose. Designed and erected to take care of expansion, suspended-type wall lining reduces or entirely eliminates spalling. Suspended walls are so designed that insulating material of any desired thickness may be installed between the outside steel shell and the inside of the refractory.

Many fluid catalytic regenerators have 4 in. of resilient block insulation behind the 3 in. of suspended-wall tile and on the basis of 1,110° F. temperature inside the vessel, the temperature of the steel shell is reduced to 175° F. The thickness of the insulation on T. C. C. kilns varies from 3 to 5 in. with temperature of the steel varying from 165° to 190° F.

The insulating concretes used in connection with catalytic regenerators and T. C. C. kilns in many cases do an excellent job, but only when the material is handled properly and installed in the correct manner, which is at times difficult in the field. Some of these materials set in a matter of minutes.

All in all suspended-wall linings have proved very satisfactory for both fluid catalytic units and T. C. C. kilns.

New Developments in Compressors for Petroleum Industry Applications

J. N. MacKENDRICK, Clark Brothers Co., Inc., Olean, N. Y.

AXIAL compressors are primarily high-volume machines for fixed operating conditions. Main application in the petroleum industry have been for pumping large volumes of oil to 40 psi. in Houdry plants.

The centrifugal compressor is now primarily a high-capacity compressor for fixed operating conditions. Of interest are those in refrigeration units operating with ethylene, isobutane, butane, and propane as refrigerants. Some very large air compressors (up to 20,000 hp.) driven from a single turbine are being manufactured together with oxygen, propane, and mixed-hydrocarbon gas machines for a plant in South Texas.

A great majority of the compressors installed in the petroleum industry have been reciprocating and due to their wide range of sizes, available types of drivers, and wide flexibility, they will continue to be very widely used. One of the larger developments are the gas-engine-driven angle compressors in sizes up to 1,600 hp. Material changes and improvements include high-velocity cooling for power cylinders and heads, cast-steel power cylinder heads and cast-steel crowns on the power pistons, a very heavy crankshaft, and rearrangement of the crankthrows so there are no major critical speeds.

There has been a demand for the semiportable compressor for gas-gathering lines that could be economically installed and operated in small compressor stations. Skid-mounted units (to 300 hp.) comprising practically all the equipment needed for pumping gas are now being installed.

Trend in motor-driven air compressors is toward multicylinder machines with higher rotational speeds, a number V-type and four-cylinder W-type machines having been put on the market. Refrigeration compressors using ammonia and freon show the same trend and are being offered in V, W and radial types.

A number of manufacturers are offering horizontal opposed or pancake-type compressors for hydrocarbon gases with horizontal, double-acting cylinders. These units have been built up to 2,500 hp., and are inherently well balanced and require comparatively small foundations.

DIFFERENT GENERAL TYPES OF COMPRESSORS, THE NORMAL PRESSURE RANGES, SIZES AND CHARACTERISTICS

Type—	Positive displacement	Normal pressure range (psia.)	Normal horsepower range	Capacity flexibility	Pressure flexibility	Type of gas handled	Types of driver available
Axial	No	14.5-75	Above 2,000	Limited	Limited	High gravity usually air	Turbine—high-speed motor
Centrifugal	No	2-275	400-20,000	Limited	Limited	Any	Turbine—high-speed motor
Fans—propeller or paddle wheel	No	12-22	To 500	Limited	Limited	Air usually	Turbine—high-speed motor
Reciprocating	Yes	2-15,000	To 5,000	High	High	Any	Direct-connected Natural-gas engine, steam engine, diesel or motor drive
Roots or lobe type	Yes	3-30	To 2,000	Speed change only	Moderate	Any	Coupled to engine or motor
Sliding vane	Yes	5-100	To 600	Speed change only	Moderate	Clean dry	Coupled to engine or motor
Liquid displacement	Yes	2-40	5-400	Limited	Moderate	Nonsoluble	Coupled to engine or motor
Screw type	Yes	Experimental to 100 lb.	3,000			Clean dry	

Mechanical and Metallurgical Control of Sulfuric Acid Corrosion In Petroleum Processes

E. R. WILKINSON, Standard Oil Co. (N. J.), Louisiana Division, Baton Rouge.

MANY factors may influence corrosion of materials by sulfuric acid, but there are certain principal factors having direct bearing on corrosion rates. These are: (1) Concentration, (2) temperature, (3) oxygen content of fluid, (4) velocities and turbulence, (5) electrolytic action. These factors must be considered both individually and collectively. Certain combinations have actually shown a beneficial effect on certain materials and at the same time have shown a decidedly detrimental effect on other materials. None of these factors should be neglected in any study of a sulfuric-acid corrosion problem.

Influence of the acid strength is in itself well known and fairly straightforward, but still certain questions regarding it are highly debatable. For instance, ordinary carbon-steel material does not corrode in concentrated sulfuric acid if all other factors are assumed to be ideal. In some circles of thought, the figure at which steel begins to corrode at uneconomical rates may be 65 weight per cent and in others 75 per cent. Experience has shown actually where a 50-60 per cent concentration was not as corrosive to the steel as 70-80 per cent acid, all basic factors being essentially comparable. In such cases, conclusion is that the lower-strength solution contained some inhibitor that the higher-strength solution lacked. On several occasions, black acid containing carbon from an operating unit has been found less corrosive than white acid for the same concentration range. This means simply that for strength alone to be the controlling factor all other conditions must be ideal or at least controlled.

Generally sulfuric acid becomes more corrosive as its temperature is increased. This, however, is not true universally if the acid contains oxygen because it may become actually less corrosive to some alloys as temperature is increased to the point of driving off the oxygen from the acid. This applies to nearly all copper-bearing alloys which are corroded more rapidly by sulfuric acid containing dissolved oxygen than by sulfuric acid which is oxygen free. If the temperature is increased appreciably beyond that point required to expel the oxygen, then the corrosion rate in all probability will increase again. When considering the temperature in making the selection of materials, distinction should be made between fluid and metal, or skin temperatures.

Care must be taken in the design of any system for handling sulfuric acid to assure that if dissimilar metals are used, they would not be in close proximity to one another, or, if possible, there should not be a wide spread in the electromotive series between the dissimilar metals.

Sulfuric-acid corrosion in acid treating and sulfuric-acid alkylation units is of general interest, but the biggest problems seem to be encountered in the auxiliary equipment that is necessary for acid reclaiming, separation, and concentration. In these operations, the most advanced mechanical and metallurgical methods of control must be applied.

In acid-concentrating units where the acid is concentrated from the 40-60 per cent range leaving the separators, up to 90 or 95 per cent, it passes through several stages essentially at boiling conditions. The most corrosion-resistant materials available must be used in these operations because of the severity of the temperature and concentrations.

Corrosion of Refinery Equipment

E. E. KERNS, Standard Oil Co. of Ohio, Cleveland.

CORROSIVENESS of crudes is determined largely by five factors: (1) Hydrochloric acid evolution, (2) hydrogen sulfide sulfur, (3) mercaptan sulfur, (4) total chloride content, reported as sodium chloride, usually referred to as "total salt," and (5) total sulfur content.

Hydrochloric acid evolution is a measure of the acid that will be formed during steam distillation under prescribed conditions. Before the development of the HCl evolution method by Davis, Jones, and Nielsen attempts were made to determine the calcium and magnesium content of crudes. Such analyses were tedious and experience has shown them unreliable for determining the extremely small amounts of these substances present in most crudes.

Hydrogen sulfide and mercaptan sulfur, determined by dry distillation of crude, are of about the same order of corrosiveness, and for convenience can be considered together as "corrosive sulfur" or "distillation sulfur." At high temperatures this form of corrosion is believed to be the controlling factor. Even at lower temperatures nonferrous alloys such as red brass and other copper alloys are attacked by sulfur in this form, but the alloys vary greatly among themselves in rate of sulfur corrosion.

Total chloride content is an important figure since it is an indication of the tendency of the crude to plug heat-exchanger tubes, and the inorganic solid content of the residual product (coke, heavy fuel oil, or asphalt) can be predicted from it.

Desalting is included under this heading, although it has the effect of preventing acid formation, rather than neutralizing it after once formed. Desalting has no measurable effect on the corrosive sulfur content of crude.

In general, ammonia neutralization is of most value in preventing HCl corrosion under conditions where water exists as a liquid. Ammonium chloride is stable up to 660° F., whereas ammonium sulfide breaks down at about 110° F.

Solid alkalies are considerably cheaper than ammonia. However, they are not suitable for neutralization of overhead vapors, due to the difficulty of obtaining thorough contacting, and also to the fact that continued contact with alkaline water is damaging to the usual copper-alloy condenser tubes.

The best-suited material for the service is sometimes determined by actual installation of test tubes or by the installation of a test spool as furnished by The International Nickel Co. Exchanger tubes vary from carbon steel to 18-8 SMo while condenser and cooler tubes are, generally speaking, admiralty, inhibited to prevent dezincification. Cupro-nickel has also proved quite satisfactory for some special cooler installations.

Where highly corrosive condensing and cooling water prevails, there is a definite need for bimetal tubes. Under special conditions such as low corrosion and high temperature, 2 per cent chrome ½ moly furnace tubes with 1¼ and 1½ per cent silicon are used for the high-temperature operation.

In cases of localized corrosion, in towers for example, the use of alloys, including monel, 11-13 per cent chrome and 18-8 chrome nickel, for liners is general practice. Some brass lining is done in low-temperature crude-still distillation.

Cathodic protection has long been used for pipe lines and now to some extent in refineries. As for nonmetallic protective coatings, most of them have temperature limitations. However, there are some new synthetic coatings that appear as having outstanding possibilities. Some of these are on test in our plants at present.

Some Performance Data on 20 and 24-In. Fluid Lines

A. N. HORNE, Texas Empire Pipe Line Co., and R. P. LENNART, Stanolind Pipe Line Co., Tulsa.

EMPIRICAL data are presented on operation of long, large-diameter crude and products pipe lines in order that engineers may draw their own conclusions. In constructing these lines from Texas to the New York-Philadelphia area there was no attempt to keep the 20-in. products line to either the right or the left of the 24-in. crude-oil line; the lines actually crossed at 41 places. Friction losses shown on curves for 24-in. line performance are slightly less than would normally be expected if pressure drop be calculated by any of the usual loss formulas based on interpretation of Stanton and Pannell's data, as a straight line in the range of normal pipe-line flows. Out-of-pocket costs for handling 1 bbl. of throughput ranged from 6.5 to 9 cents for crude oil and 9.1 cents to 12.6 cents for products, depending on the rates of flow. Throughput for three grades of crude varied from 130,000 to 340,000 bbl. daily. Seven products were handled. However, for several months while handling gasoline products only, 80 per cent of the 235,000-bbl. daily capacity was 100 octane.

Difference between the total amount of contamination occurring in a heating oil-gasoline movement and a movement involving two grades of gasoline only was almost exactly equal to the quantity of the buffer slug of the heating oil-gasoline movement. This was achieved by having a buffer slug of a size calculated to equal the total amount of contamination existing at the end of the pipe line after a normal movement. No part of the leading product would contaminate any of the following batch. In other words, all contamination of both grades would take place in the buffer slug between the two grades.

Rate of contamination varied directly as the distance traversed and did not vary appreciably with the rate of movement, provided the rate of movement was above the critical. Batched shipments were moved as slowly as 85,000 bbl. daily but even at this slow rate there was no indication that the lower critical had been reached. A large part of the contamination of both lines was the result of mixing at the initial end.

During operation the centrifugal pumps on the 24-in. line actually increased in efficiency so as to attain or exceed the design efficiency. This was due to the polishing action of mill scale and sand which was left in the line during construction. Since there was not as much abrasive action in the 20-in. line, there was no similar increase in efficiency of the pumps. The closed-type operation required exact dispatching to maintain identical rates of flow between all stations.

The small amount of unit hours pumping time lost is indicated by the April 1945 record for both lines which is fairly representative of normal operating experience. Lost hours were calculated by multiplying the hours lost by the number of units at the particular station where trouble occurred.

Line	Packing	Mechanical pump trouble	Electric motor trouble	Low voltage	Power failure	Control equipment	Misc.	Total hrs. lost
24-in.	:54	7:02	27:09	1:11	10:41	0	24:10	71:07
20-in.	..	4:58	....	0:58	19:18	2:53	20:01	48:08

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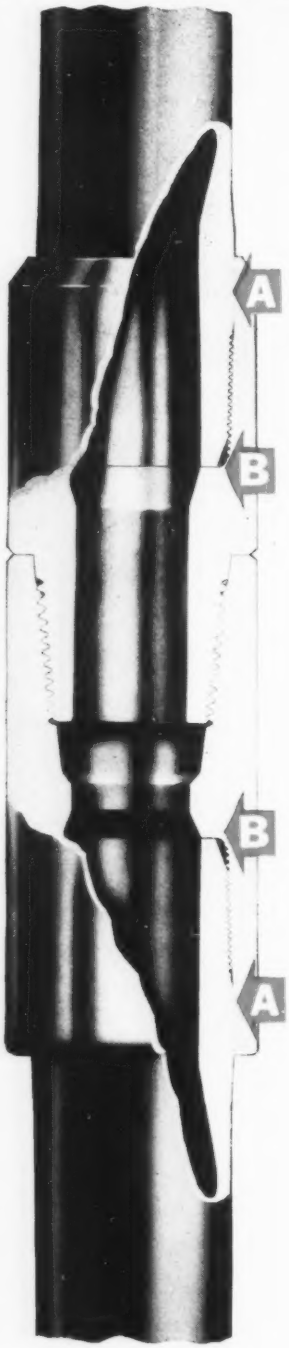

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Drilling Equipment Needs

DOUGLAS RAGLAND, Humble Oil & Refining Co., Houston

THE rapid increase in drilling time and costs as well depth increases illustrates the need for fundamental improvements in drilling equipment and technique. In the case of many deep wells in the 10,000-ft. and deeper class, the actual drilling operation consumes less than half of the total rig time, and items other than drilling are largely responsible for the high total-per-foot cost.

Critical examination of the operation of present drilling equipment suggests many possibilities for fundamental improvements that would result in decreased deep drilling costs. These suggestions include the substitution of automatic or semiautomatic power-operated machinery for manually-operated devices; complete elimination of sand from drilling fluid, which would lead to the application of centrifugal pumps to drilling service; development of drilling fluids that will not cause hole enlargement; inexpensive and thoroughly reliable equipment for formation evaluation, and an acid-proof oil-well cement having low resistance to perforation and the ability to set up and form an impermeable seal between the casing and the formation when thoroughly contaminated with drilling fluid.

Relief Valves, Their Function and Maintenance

JOHN GIESEKE, Crosby Steam Gauge & Valve Co., Dallas.

RELIEF valves have one function only, that of relieving, within a closed system, pressure in excess of that for which the given relief valve, or valves, are set. Attendant to this function is that a given relief valve must have sufficient capacity to relieve the excess pressure.

Relief valves, are normally used in the oil-and-gas-processing industry, are precision devices, their internal parts carefully machined to close tolerances. Therefore alignment of parts must be accurate. Relief valves should have appropriate care by trained crews under trained mechanics. Proper care of parts in servicing the relief valve is a factor in longevity.

All plant relief valves should have identification symbols or tags, and complete records should be kept of them. Another record should be maintained for use in inspection, testing, and in the repair shop so that proper instructions for set pressures or changes in internal parts may be indicated.

Relief valves can function properly and dependably only if the part relations are maintained as the manufacturer designed and originally constructed them. Consequently plant shop-repair procedures must approach closely those employed in manufacture.

Hydraulic Decoking

A. V. WELSH, Worthington Pump & Machinery Corp., Harrison, N. J.

IN the modern hydraulic decoking method coke is removed hydraulically by means of high impact-producing jets incorporated in special boring and cutting tools. These tools are attached to the end of a hollow drill stem which is suspended from a swivel joint. An airmotor incorporated in the swivel joint rotates the drill stem at the required speed.

Coke is removed in two steps. The first is to bore a hole from the top down through the coke bed. After the initial hole has been bored, present-day practice is to replace the boring tool with the cutting tool. The cutting tool is then lowered to the bottom of the coke bed and raised in successive steps by the operators. The cutting tool has four hydraulic jets. Two of the streams are projected horizontally, and the two lower nozzles point upward so that the two streams meet at the chamber wall. The horizontal jets penetrate the coke bed to the chamber wall, whereas the lower jets hitting the coke bed from the underside tend to clean the sidewalls of the chamber as the tool is rotated. A high-pressure multistage centrifugal pump supplies water to the cutting nozzles.

During normal operation it is necessary to start and stop the water flow to the tools several times. Rather than start and stop the large jet pump prime mover each time, provision is made to throttle and divert the discharge from the pump into a bypass line back to the source of supply by means of a hydraulic control valve.

A special motor-operated hydraulic control is used which consists of a main and a bypass valve synchronized 180° apart and operated by a cam mechanism which closes one valve while opening the other. Shock is reduced with a time-delay device incorporated in the hydraulic control.

Water used to cut coke is not suitable for discharge into sewers until it has been filtered, or the coke fines allowed to settle out, because the fines will plug up a sewer.

Performance figures for a number of hydraulic decoking installations are:

Chamber diameter (ft.)	Height in str. section (ft.)	Average cleaning time (hours)
13	50	4½
13	50	2¾
13	50	6½
16	37	5
16	37	6¾
13	57	5¼
17	61	5

It is interesting to note that the first three installations had identical coke-removal equipment but the average time varied from 2¾ to 6½ hours. This variation is due to the characteristics of the coke encountered at the different locations.

First commercial hydraulic decoking system was installed at the Shell Oil Co., Inc., refinery at Wood River, Ill., in 1938, and has been in continuous operation ever since. This particular system had six 13-ft. diameter by 50-ft. high chambers, and used a 700-g.p.m., 1,000 psi. centrifugal jet pump. The largest unit of 12 installations has chambers 17 ft. in diameter by 61 ft. in the straight section, and uses an 1,100-g.p.m., 1,500-psi. centrifugal pump.

Heat-Exchanger Design

D. E. FIELDS, Tulsa Boiler & Machinery Co., Tulsa.

ALLOWABLE pressure drop is an important feature for the engineer to bear in mind in designing heat exchangers. Most efficient heat-transfer rates are obtained at high fluid velocities. However, these high rates of fluid flow result in increased pressure drop, or loss, through the heat exchanger. In actual design and operation it is necessary that a compromise be made between these two factors. Pressure drop through heat exchangers determines the number of passes both through and around the tubes.

There are three types of shell-and-tube heat exchangers—the fixed-tube sheet type, the floating-head removable-bundle type and the floating-head nonremovable-bundle type. If the exchanger is to operate in a service where it is necessary to clean the bundle occasionally, it should be of the floating-head removable-tube-bundle type. In handling dirty stocks and where the tube bundles have to be cleaned on the shell side frequently, tubes on a square pattern should be used as this will facilitate cleaning through the rows. Triangular pitch of the tubes is employed where cleaning between the lanes is not important; exchangers so designed will have a higher transfer rate than those having square pitch.

In designing a heat exchanger, the following should be kept in mind: A high transfer rate is obtained at the expense of pressure drop. If the fluids are clean, the fixed-tube-sheet type is most economical. If heating or cooling mediums are dirty, floating-head removable-tube-bundle units should be used.

Pump Cavitation

B. R. WALSH, Gulf Research & Development Co., Pittsburgh

CAVITATION should be charged to a pump (at sea-level atmospheric inlet pressure) when its entry loss is high enough to cause critical reduction of its normal liquid delivery with no restriction placed ahead of the pump inlet flange.

Remedies for cavitation are:

1. Reduction of pump entry loss to absolute minimum.

(a) Reduction of centrifugal-force loss by reduction of peripheral speed or reduction of clearance volume.

(b) Use of side pockets (in a spur-gear pump to reduce tooth loss).

(c) Incorporation of pickup blades or ports.

(d) Enlargement of inlet passage with elimination of turns and bends.

2. Increase of pressure available at pump inlet.

(a) By reduction of inlet line loss.

(b) Increase of liquid supply head.

(c) Installation of centrifugal booster (for positive-displacement pumps).

(d) Pressurized supply tank.

3. Elimination of entrained air (and dissolved air, if feasible).

Gravity and Pressure Oil Filters, Their Uses and Applications

EDWIN M. MAY, Bowser, Inc., New York.

FILTERING media may be solids, such as porous metal or metal screens, and semisolids such as paper, or cloth or some other textile material, and loose filtering media in the form of powders such as diatomaceous earth, fuller's earth, bone-black, etc. Other filter media such as excelsior or cotton waste are sometimes used, but because of the ability of the latter to permit channeling, they are not given much consideration. Then again there are various types of clays which filter by mechanical means as well as by adsorption.

Filters are classified as either gravity or pressure, and batch, i.e., intermittent or continuous. Gravity filters may be divided in two classes, dry and wet filters. Dry filters are almost universally used, as the theory of being able to remove impurities from an oil by passing it through water has long since proven to be quite unsatisfactory.

With the advent of rust and oxidation-inhibited oils, use of a waterwash is "taboo" as water will remove the inhibitors. Likewise, these inhibitors are removed by filters using clay or fuller's earth as a filtering medium.

Dry filters are used both for filtration of dry oils (as distinguished from oils having free water), and also for oils having free water. In this latter case they are equipped with an automatic water-separating device.

Batch-type filters are used where it is

(Continued on page 105)

New Developments in

Suspensoid Catalytic Cracking

by C. F. Burk

ABSTRACT

ALTHOUGH improvements in plant technique resulted in the production of 10-lb. R.v.p., 400-e.p. distillate having an A.S.T.M. octane number of 75.0 clear, pilot-plant studies have shown that further increases in octane number can be achieved.

Experience in pilot unit has indicated that the suspensoid catalytic process can utilize the synthetic Type 3A catalyst to advantage. Without sacrifice of throughput, and operating under conditions readily attainable in refinery practice, it has been possible to obtain a motor fuel having an A.S.T.M. octane number of 78.0 clear, excluding polymer gasoline.

Since light and heavy naphtha can be included with the feed stock, the simplicity and flexibility of the suspensoid catalytic process is an attractive feature. It is important to realize that a process is being developed which will raise the octane number of the over-all refinery pool gasoline, and only requires conventional cracking equipment plus small catalyst-handling and regeneration facilities to do so.

THE suspensoid catalytic cracking process developed by Imperial Oil, Ltd., Sarnia, Ont., Canada, is based upon the use of relatively small quantities of catalyst in conventional thermal cracking equipment. A description of the process and typical operating data obtained some years ago may be found in previous literature (see bibliography) which reported the production of 10-lb. R.v.p., 400° F. end point gasoline having an A.S.T.M. octane number of 73.2 clear and a C.F.R. research octane number of 82.0 clear from a mixed refinery feed stock containing 25-30 per cent of heavy naphtha. If the polymer gasoline is included the A.S.T.M. octane is 75.5 clear and the research octane number is 85.1.

Recent Plant Developments

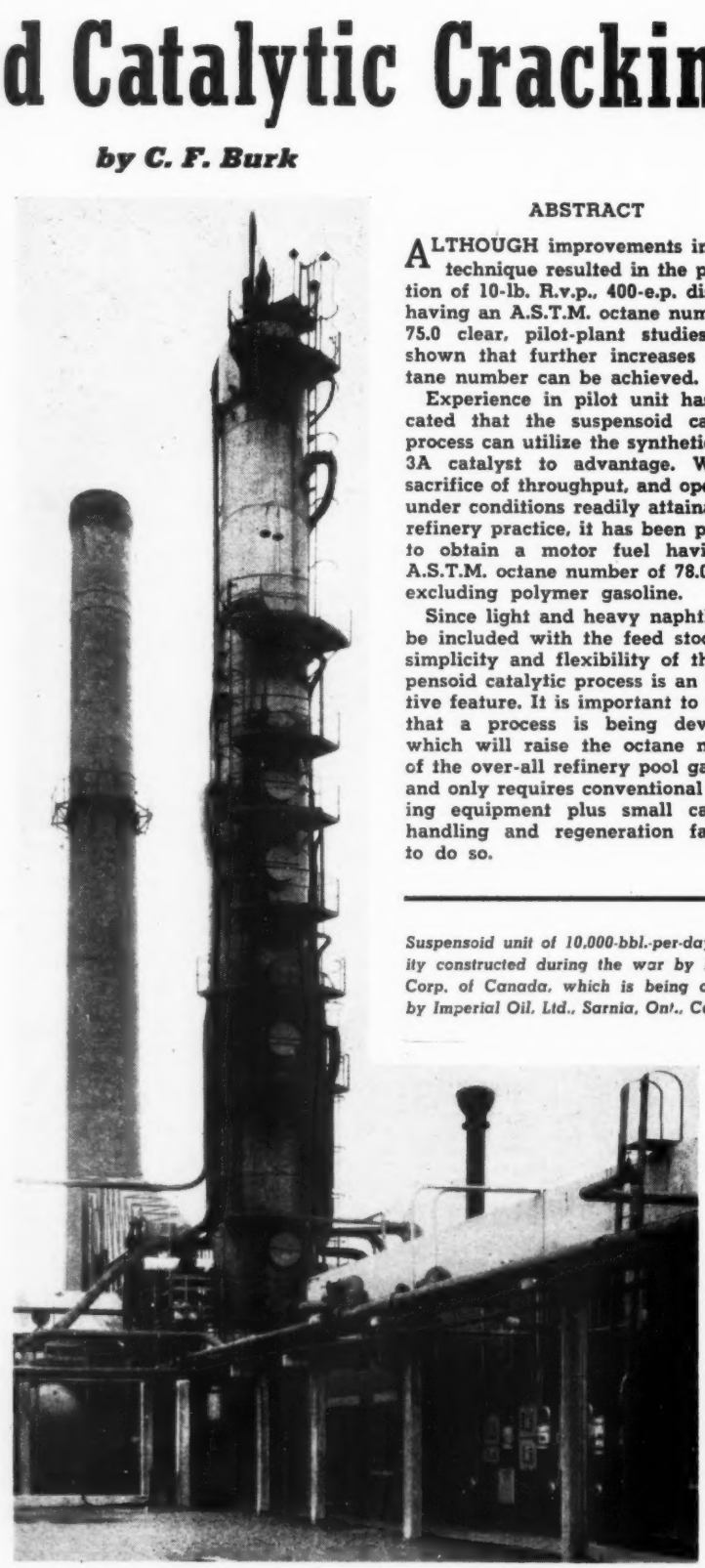
Despite the concentration of effort in operation of the cracking coils during the war years to supply the maximum quantity of butylenes to the adjacent synthetic-rubber plant at Sarnia, sufficient test run data were accumulated on suspensoid cracking to establish several important features of the process.

First, it was noted that for a given octane number (75.0 A.S.T.M. including polymer gasoline) it was possible to obtain a 5 per cent greater yield of 10-lb. R.v.p. gasoline on fresh feed by cracking mixed feed stocks under suspensoid conditions as against reforming heavy naphtha, and suspensoid cracking intermediate and heavy gas oils separately.

Secondly, cracking of cycle gas oils could be accomplished by the injection of a propane or butane cut in the feed stock. The resultant 10-lb. R.v.p. distillate (excluding polymer gasoline) had an A.S.T.M. octane number of 76-78 clear.

Thirdly, the A.S.T.M. octane number of 73.2 clear, mentioned in the in the introduction could be raised to 75.0 A.S.T.M. octane number by operating at a higher conversion level (20.4 vs. 12.5 wt. per cent dry gas). Inclusion of polymer gasoline raised this octane number to 78.0 clear. Operation at the higher-conversion, higher-octane level was remarkable because of the fact that no decrease in the yield of gasoline was experienced.

The erection of a pilot plant has permitted a more complete study of



Suspensoid unit of 10,000-bbl.-per-day-capacity constructed during the war by Polymer Corp. of Canada, which is being operated by Imperial Oil, Ltd., Sarnia, Ont., Can.

the effect of various operating conditions as well as the effect of various catalysts as applied to the suspensoid process than was possible in the refinery units. The pilot unit comprises catalyst-mixing and slurry-injection facilities, heater coils, and fractionation equipment conventional for this type of experimental plant. It was designed to explore suspensoid cracking operations on all types of stocks at pressures up to 1,000 psig. and temperatures up to 1,200° F. A very satisfactory feature of the pilot unit has been its ability to confirm the operating experience and results obtained previously in the refinery units.

The type of catalyst employed in refinery suspensoid cracking has been spent Filtrol clay obtained from a lube-oil contact plant, used at the rate of approximately 2.0 lb. clay per barrel of fresh feed. It was decided in the pilot-unit operations to increase the catalysts being investigated to 10 lb. per barrel of fresh feed in order to obtain the full effect of activity. This amount represents a quantity that can be reasonably handled with existing refinery facilities.

Pilot-Plant Results

Of the catalysts employed thus far, the synthetic catalyst 3A used in the fluid catalytic cracking units has given the most encouraging results. A typical illustration of the change that occurs in the properties of the cracked distillate when produced with a synthetic catalyst as compared to one produced with a natural catalyst is shown in Table 1.

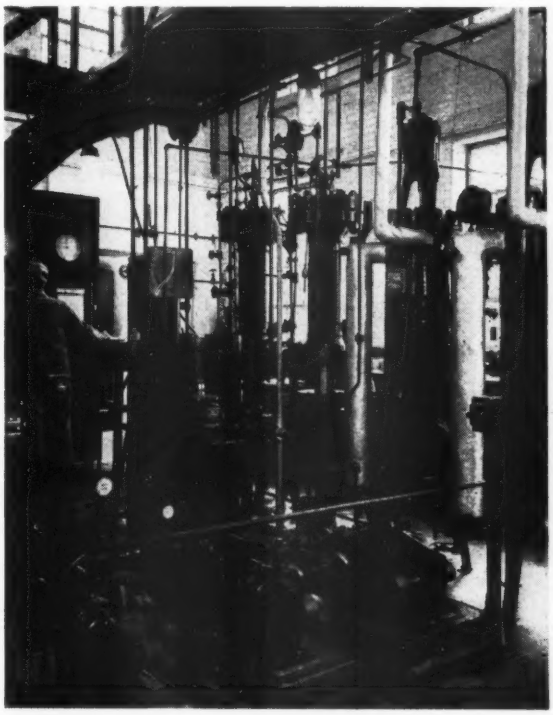
TABLE 1—PROPERTIES OF CRACKED DISTILLATE WHEN PRODUCED BY NATURAL AND SYNTHETIC CATALYSTS

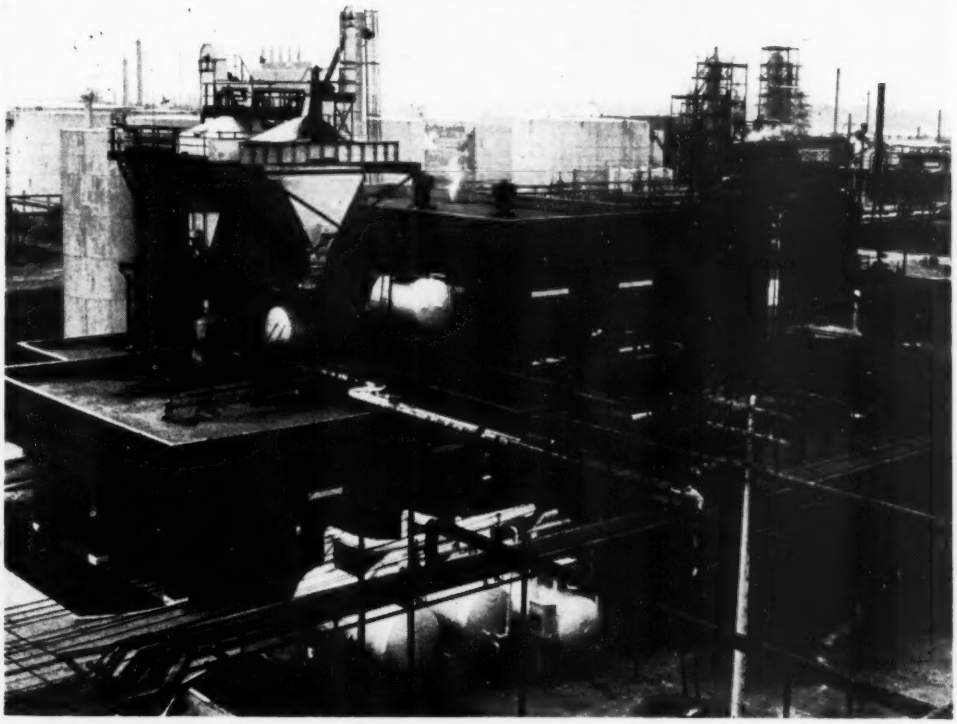
Catalyst—	Refinery, spent Filtrol from lube plant	Pilot plant— Fresh Filtrol	Pilot plant— 3A
Per cent heavy naphtha in feed	25	25	25
Coil pressure, psig.	400	400	400
Coil temperature, °F.	1,055	1,065	1,055
10 lb. R.v.p., 400° F. e.p. dist. (excl. poly.):			
Oct. No., clear, A.S.T.M.	73.2	73.5	75.4
Aniline point, °F.	79	80	81

Two important observations from this table are:

1. With a mixed feed stock containing 25 per cent heavy naphtha, use of 3A will give a higher A.S.T.M. octane number than can be obtained under similar conditions using a natural catalyst. It is also very satisfying to note that pilot-plant and refinery test data agree when using the natural catalyst.

2. The composition of the distillate is different when using synthetic or natural catalyst as shown by the different aniline point - octane number relationships. It will be noted that for the same aniline point, the octane number of the distillate produced when using the 3A catalyst is two octane numbers higher.





Above: Pumps, feed drums, and slurry mixers in suspensoid pilot plant of Imperial Oil, Ltd. Left: Tar-filter plant in suspensoid cracking unit. Charging capacity of cracking coil is 20,000-25,000 bbl. per day

Past experience has shown that the successful operation of the suspensoid catalytic process depends upon the maintenance of the feed and products of reaction in the vaporized state during their passage through the heat-

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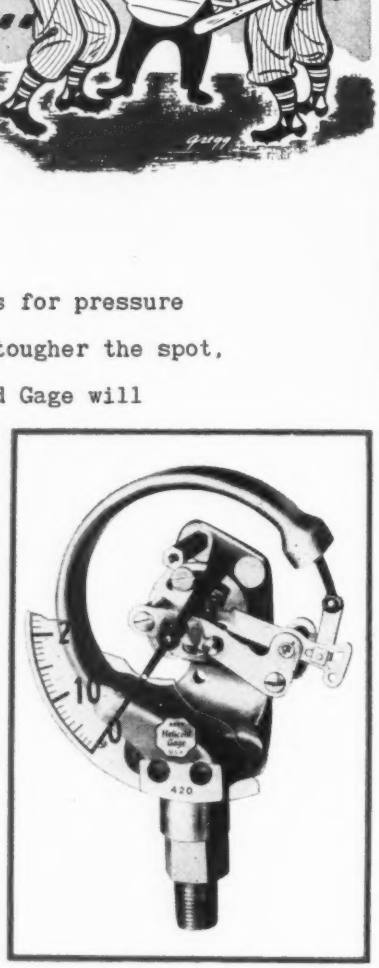

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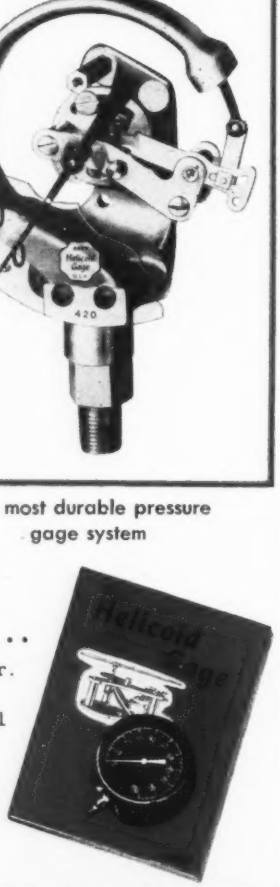

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ing coil. One method to assist this vaporization is to include low-boiling materials with the mixed gas-oil feed. Experimental work, summarized in Table 2, shows that either light or heavy naphtha may be added to the feed.

These data show very strikingly that only a slight change in octane number was obtained over the range of naphtha addition studied. Since a high-octane-number product can be obtained in the presence of 50 per cent of naphtha, it suggests development of a process which can reform naphtha and crack gas oil simultaneously.

As an illustration of the effect of the operating temperature upon product quality and distribution, Table 3 summarizes the changes which occur over a range between 1,055° to 1,095° F. Feed-stock characteristics are shown in Table 4.

The data given in Table 3 exhibit the same characteristic of the suspensoid catalytic process mentioned previously, namely, that an increase in conversion and octane number may be obtained without any sacrifice in yield of motor distillate. All the runs made in the pilot unit are conducted at throughputs comparable to refinery practice, i.e., 8-10 V./V./H.* Therefore, an increase in octane number does not entail any loss in capacity.

C. F. Burk graduated in chemical engineering from University of Toronto in 1929; he joined Imperial Oil's technical and research department in 1932, and transferred to the engineering development department in 1937. He was sent to Talara, Peru, in 1938 as technical assistant at the International Petroleum Co. refinery there, and returned to Canada in 1943 as production controller for the butadiene division of Polymer Corp., Ltd., aiding in making synthetic rubber. He is assigned temporarily to the technical and research department at Sarnia, but will return to Peru this autumn as technical superintendent.

TABLE 2—USE OF NAPHTHAS TO AID VAPORIZATION, SYNTHETIC TYPE CATALYST

Per cent light naphtha in feed		10	14	25
Per cent heavy naphtha in feed	25	25	36	
Total naphthas	25	35	50	25
Coil pressure, psig.	400	400	400	400
Coil temperature, °F.	1,075	1,075	1,075	1,075
10 lb. R.v.p., 400° F. e.p. dist. (excl. poly.):				
Oct. No. clear, A.S.T.M.	77.0	76.8	76.2	76.4

Octane-Rating Attainment

Another noteworthy feature of the data given in Table 3 is the attainment of octane ratings competitive with other catalytic processes by using a small quantity of catalyst.

The method of recovering the catalyst is being investigated, work already having been completed on stripping the oil from spent catalyst. In a 20,000-bbl.-per-stream-day plant using 10 lb. catalyst per barrel of feed, facilities would be necessary to handle 5-6 tons per hour, but this amount is very small compared to the quantity regenerated in competitive catalytic crackers. Hence, it is not felt that catalyst regeneration presents a difficult problem.

*(V./V./H. = volumes of liquid charge per volume of catalyst per hour. Ed.)

Significance of Results

The simplicity of the process is a characteristic which cannot be overlooked. There is no need to segregate or precondition feed stock, no necessity to reform naphthas separately, no worry concerning prolonged shutdowns with attendant additional labor requirements, and no expensive equipment to maintain.

The flexibility of the suspensoid catalytic process is another feature which merits attention. Feed stocks of varying composition can be handled without encountering any drastic change in the properties of the products. For satisfactory operation of the process it has been stated that the only requisite is the presence of sufficiently low boiling material to vaporize the feed stock. However, should naphtha be available, it is perfectly satisfactory to use water to assist in vaporization, a practice which has been carried out in the refinery for the past several years. Thus, a shortage of any component of the normal feed stocks entails no reduction in cracking capacity, operability, or product quality.

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"Suspensoid Catalytic Cracking Process," The Oil and Gas Journal, Mar. 31, 1945.

"Suspensoid," The Oil and Gas Journal, Mar. 30, 1946.

TABLE 4—PROPERTIES OF FEED STOCKS (MID-CONTINENT CRUDE SOURCE)

Feed stock—	Light naphtha	Heavy naphtha	Int. gas oil	Heavy gas oil
A.P.I. gravity	59.4	49.4	35.5	28.5
Aniline point	136	138	166	184
A.S.T.M. distillation:				
I.b.p.	123	270	234	416
10 per cent	170	298	492	629
50 per cent	270	337	558	702
90 per cent	350	398	644	748
Octane No. A.S.T.M.	48.8	31.7		
Octane No. Research	48.5	27.4		

TABLE 3—YIELDS AND PROPERTIES OF SUSPENSOID CATALYTICALLY CRACKED MOTOR FUEL AT VARIOUS TEMPERATURES*

Lb. 3A catalyst per bbl. feed	10		10		10		10	
Coil pressure, psig.	400		400		400		400	
Coil temperature, °F.	1,055		1,075		1,085		1,095	
Yields, volume per cent—	Excl. poly.	Incl. poly.	Excl. poly.	Incl. poly.	Excl. poly.	Incl poly	Excl. poly.	Incl. poly.
Gasoline, 400° F. e.p., 10 lb. R.v.p.	52.4	58.7	53.0	60.8	52.2	59.8	52.0	61.2
Excess butane	4.6	0	5.6	0	4.4	0	6.4	0
Heating oil, 415-600 V.T.†	18.8	19.1	12.7	13.1	9.0	9.4	10.9	11.3
Fuel oil, over 600 V.T.‡	12.2	12.2	12.4	12.4	14.0	14.0	10.8	10.8
Dry gas, weight per cent	15.3	12.9	18.9	15.9	22.3	18.7	22.3	18.7
Properties of gasoline—								
Octane No. clear, A.S.T.M.	75.4	77.4	76.2	78.5	77.1	79.4	78.1	80.6
Octane No. clear, Research	86.9	87.6	88.4	89.0	89.4	90.0	90.5	91.4
With 1 cc. TEL	90.8		92.9		92.8		93.5	
With 3 cc. TEL	94.3		95.4		95.6		95.3	

*Feed stock: 25 per cent heavy naphtha, 49.6 per cent int. gas oil, 25.4 per cent heavy gas oil at 9.3 V./V./H. †As conversion increases, gravity drops from 28.3° to 22.6° A.P.I. ‡As conversion increases, gravity drops from 12.1° to 2.8° A.P.I.

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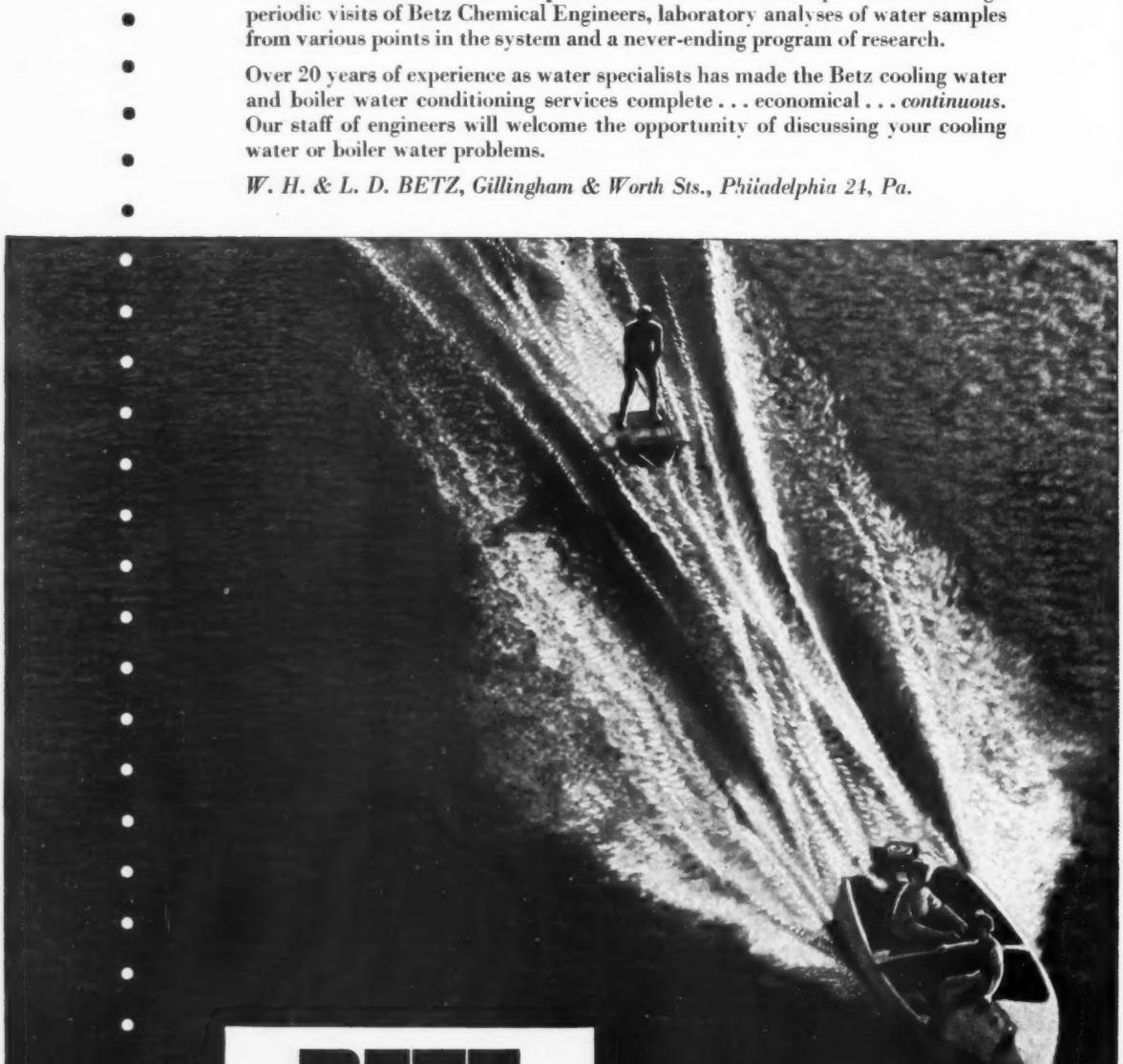

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BOILER WATER CONDITIONING

▲ Cover photograph from the *Betz Indicator*, a monthly publication devoted to the chemistry and practical applications of water conditioning. The *Betz Indicator* will be mailed without charge at your request.

(Continued from page 99)

not necessary to filter continuously. Oil from air compressors, motor bearings, small turbines, and refrigerating machines are usually handled satisfactorily in batch filters. When such a filter is used for oil from ammonia compressors it is desirable that all brass parts be eliminated because of the possibility of corrosion.

Pressure filters employ not only cloth as a filtering medium but lend themselves admirably to the use of filter aids such as diatomaceous earth, etc., and metal filter elements. Again the selection of the type of filter medium to be used depends on the liquid to be filtered and other local conditions.

Significance of Fluid Properties In Gas-Condensate Reservoir Engineering

KENNETH EILERTS, Bureau of Mines, Bartlesville, Okla.

THREE factors are considered by the engineer in developing a reserve of gas-condensate fluid products: Economic circumstances; characteristics of the formations in which the reserve is held; and properties of the fluid. The last mentioned of these factors is considered in this paper with the necessary references to the formation as a porous and permeable medium for conducting fluid flowing toward withdrawal wells.

Typical problems are treated, not so much with the purpose of review as to indicate what next step can be taken in increasing engineering knowledge to the development of more efficient recovery methods. The problems are those that are involved when pressure maintenance by gas cycling is practiced and also those that are characteristic of straight production. Significant differences in the flow characteristics of both lean and rich fluids (those containing more than 4 gal. of butanes and heavier components per 1,000 cu. ft. of gas) are considered.

The problems are as follows:

1. Size of the reserve.
2. Composition of the reservoir fluid.
3. Phase state of the fluid in the reservoir.
4. Change in the phases of the reservoir fluid as pressure declines.
5. The phase relations of mixtures of dry gas and reservoir fluid.
6. The recovery of hydrocarbon liquids precipitated in the reservoir from lean fluids.
   a. Determination of liquid saturation of the reservoir sand.
   b. Flow of liquid through the reservoir sand.
   c. The possibilities for liquid flow in formations found by test to contain a single-phase, gas-like fluid.
7. The recovery of rich gas-condensate fluids.
8. Phase-equilibrium factors for gas-condensate systems.
9. Natural-gas hydrates.
10. The control of corrosion in gas-condensate wells.

Particular attention is given to problems 6 and 7 relating to the possibilities for recovery of liquid hydrocarbons by flow through the formation to the producing well.

Modern Oil Filtration and Purification Methods

FINLEY M. STEELE, The Hilliard Corp., Elmira, N. Y.

TO avoid misapplication, the purchaser of oil-conditioning equipment need consider only three basic factors: (1) Requirements for the conditioner, including type and location of equipment in which lube oil is used; nature of contamination and contamination rate; amount of oil in system; oil pressure, temperature, viscosity, and circulation rate; type of oil; specifications for purified oil. (2) Available equipment which meets requirements and how it functions. Present conditioning equipment employs six methods in their designs: gravity separation, centrifuging, filtration, magnetic separation, distillation, and chemical treatment. Method of installation should receive careful study. (3) Investment and operating costs should be determined and equipment selection made on basis of lowest combined cost.

Basic designs for Hilco oil-purifying equipment, for example, employ three conditioning methods: Gravity separation, filtration and vacuum distillation.

The Hyflow-type oil filters employ depth filtration through filter cartridges, using either fuller's earth or cellulose. Cartridges are of throwaway or repackable types; the casings may be heated electrically or jacketed for steam or hot water heat. Necessary temperature and pressure regulators are provided. They are primarily intended for removing suspended solids from oil, and typical applications include those on internal-combustion engines and compressors.

The Hilco oil reclaimer combines a filter with a vacuum vaporizer which removes moisture, fuel dilution, solvents, dissolved gases which have a lower boiling point than the oil itself. By direct connection to a lubricating system, constant recirculation through the reclaimer maintains the quality of the oil. Applications include diesel and gas engines, steam turbines, mechanical vacuum pumps, etc.

Four recommendations are made to industry: (1) Adoption of a standard terminology. Considerable confusion results from indiscriminate use of such terms as refine, condition, recondition, filter, purify, reclaim, clean, sweeten, clarify, polish, rectify, renovate, purge, and a host of others. (2) Publication of a composite catalog of all types of oil-conditioning equipment, including a glossary of terms. (3) That technical schools and colleges place more emphasis on lubrication engineering which is rapidly becoming one of industry's major problems. (4) The A.S.M.E. seriously considers as a permanent project the study and correlation of all new data pertaining to lubricating systems, lubricating oil, and oil-conditioning equipment.

Some Notes on the Use of Free Machining Steels in Connection With Petroleum Equipment

M. E. HOLMBERG and F. A. PRANGE, Phillips Petroleum Co., Bartlesville, Okla.

FIELD service requirements should be the main criterion in selecting a suitable steel, whereas free-machining steels are often selected solely because of their superior machinability. The same properties that aid machinability result in the steel being brittle and unsuited for many services. Free-machining materials should not be used where the finished piece may be subjected to overloading or plastic deformation. A good criterion to use in determining whether or not free-machining steel should be used is to consider whether or not high-tensile cast iron could be used interchangeably.

The paper discusses numerous failures of free-machining materials used in equipment manufactured for the oil industry. The hazards associated with the failures of some even relatively small pieces are shown. Examples of failures are reviewed which were caused by shock, stress concentration, fatigue, corrosion, welding, and high temperatures.

High-Pressure Pipe Lines Transport Helium

(Continued from page 86)

water from the trough made frequent replenishment necessary. The trough was pulled along the line by two men while a third man kept it upright and watched for gas bubbles in the water, and a fourth man kept water in the trough. The necessity for using the trough was "cussed" in every language from English to Navajo, and it was considered a great nuisance by hardened pipe-liners in the employ of the contractor—but it served a very useful and essential purpose. No leaks were found by the trough, but it was effort well spent, since all leakage tests since completion of the line indicate negligible loss.

Special Excess-Flow Valve

As the value of helium is high, it was desirable to have a device to shut off the flow in the line if it should increase beyond a predetermined rate, as would be the case if a break or large leak should develop. A device for the purpose, known as a mercury-actuated excess-flow valve, was invented by Carl E. Baird, mechanical engineer of the Bureau of Mines, and developed by the bureau for use on its helium pipe lines. The valve is double acting, so that it closes for an excess rate of flow through it in either normal or reverse direction of flow. These excess-flow valves were placed at 5-mile intervals in both lines and on each side of the Canadian River crossing on the Amarillo-Exell line. If the line should develop an excessive leak between two of the valves, the valves on each side of the leak would close permitting only the loss of helium from the five-mile section containing the leak. As can be seen in an accompanying figure, the valve consists of an orifice plate, on each side of which is a seat for a ball check. Flow of gas is through the seats and the orifice. The orifice creates a differential pressure as in an orifice meter, and this differential pressure is imposed on a mercury manometer or U-tube, which causes the mercury level on the downstream side of the orifice to rise, thereby raising the ball check. Of course, there is always a differential pressure present whenever there is flow, but the orifice size and amount of mercury can be changed so that the ball checks will ride well below the gas stream during normal flow and will be raised to the seats only when a predetermined excess flow rate is encountered. Experiments proved that regular orifice-meter coefficients could be used with sufficient accuracy to determine proper orifice size and amount of mercury in the manometer.

The Amarillo-Exell line is equipped with back-pressure regulators at both

DA Pressure Control

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GLASS FACE
The glass face on the cover permits seeing the entire operation of the control in plain view. One can always tell whether the switch circuit is open or closed, a great convenience whenever servicing becomes necessary.

Consult Mercoid on pressure, temperature, liquid level or automatic mechanical control problems.

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plants and at the injection well. The regulators are of a needle-valve pilot-operated type. The regulators are set so that the Exell plant can put helium into the line continuously, the Amarillo plant can make withdrawals as the demand requires, and all that is not taken by the Amarillo plant will go into the injection well. This is arranged by setting the back pressure, held at the Amarillo plant, approximately 25 psi. lower than the back pressure being held at the injection well. Flow through the line can be reversed easily, so that the Amarillo plant can furnish helium to the Exell plant.

An unusual incident that demonstrated the effectiveness of the excess flow valves occurred shortly after the pipe line was placed in operation. On January 20, 1945, a flow of helium was begun in the pipe line from the Exell helium plant to the injection well. A schematic drawing of the pipe line between the plant and the injection well in the Cliffside field is shown. The pipe line was full of natural gas when the helium flow began. The pressure of the natural gas in the pipe line was 690 psi., corresponding to the well-head pressure of the injection well. However, the operating pressure on the line increased to 740 psi. when the vertical string of tubing in the injection well became filled with helium. For the first 2 days of operation, all excess flow valves were bypassed and both branches of the river crossing were open to flow; that is, block valves A, B, C, D, and E were opened and block valve F was closed. Helium was metered into the line at the Exell helium plant and into the injection well. On January 22, after 2 days of helium injection, excess flow valves Nos. 3, 4, and 5 were put into service. On January 28, it was decided to close off one side of the river crossing.

Until this time, both branches of the river crossing had been open so that helium could flow through either branch. The Exell plant put helium into the line at a steady rate of flow during the period covered by the meter chart for that day. It had been decided to close off the west branch of the river crossing; and at 2:15 p.m. January 28, block valves A and C were closed, forcing all of the flow through the east branch. Shortly thereafter, the operator at the Exell plant noticed the pipe-line pressure on their end of the line beginning to rise. Inspection of the injection-well meter chart at 4:30 p.m. revealed that flow had stopped at 2:45 p.m. It was immediately assumed that one of the excess flow valves had closed, and inspection disclosed that excess flow valve No. 4 had closed. However, no line breaks or leaks were found; therefore, the reason for closing of this valve was not apparent. Before bypassing the closed valve,

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excess flow valve No. 3 on the opposite side of the river was bypassed as the increased rate of flow accompanying depressuring of the line section to the Exell plant was almost certain to cause closure of excess flow valve No. 3. Then excess flow valve No. 4 was bypassed at 5:10 p.m., once more opening the line to the injection well.

Inspection of the meter injection-well chart revealed unusual flow conditions. The first period in which the pen went beyond the limits of the chart was due to releasing the pressure built up in the line on the upstream side of the closed excess flow valve which caused an increase in the rate of flow through the meter. As production into the line at the Exell plant had been at a constant rate, there at first seemed to be no reason for the second surge of high flow or the reduction to very low flow. Also, the reason for the closing of the excess flow valve had not been discovered.

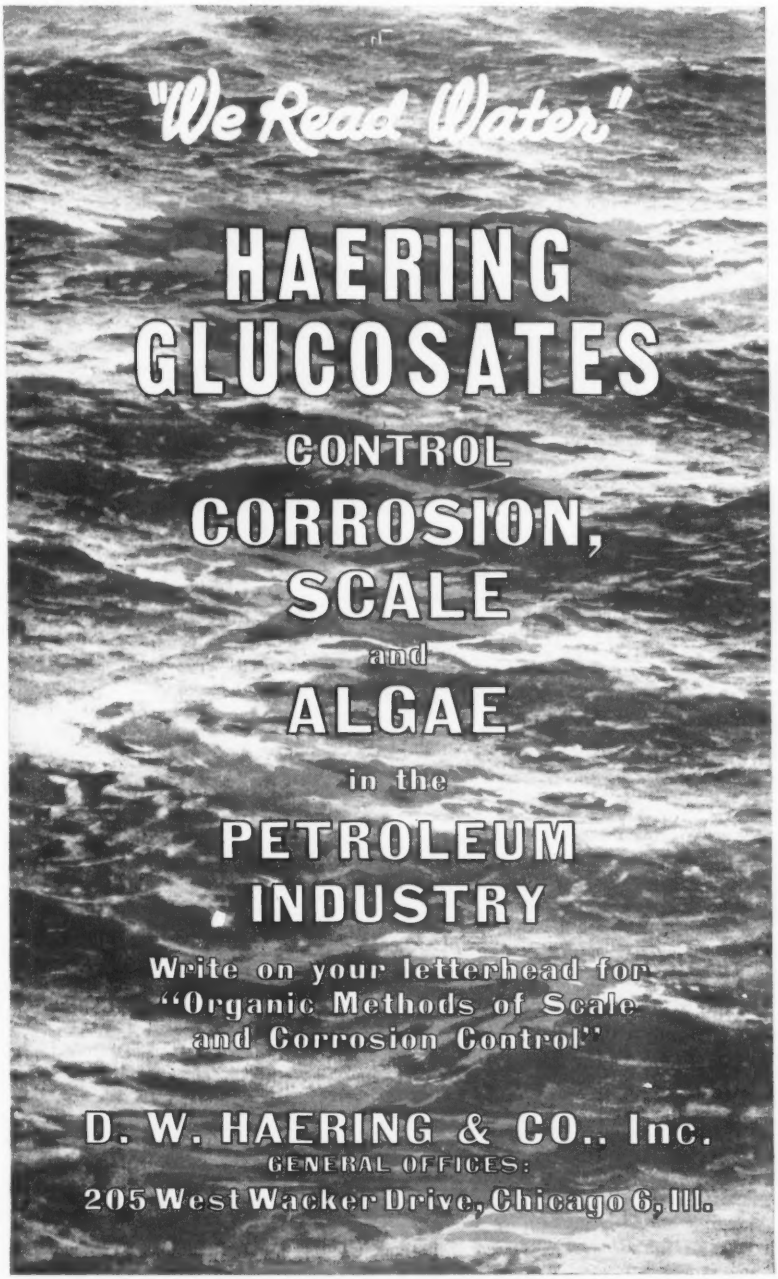
The eventual answer seemed to be that, prior to the closing of the west branch of the river crossing, all of the helium had been flowing through that branch and the east branch remained full of natural gas. After one side of the river crossing was once filled with helium, the resistance to flow through that side was not great enough to start the flow in the other branch of the crossing so that flow continued through the helium-filled side without materially disturbing the natural gas-filled side. Each branch of the river crossing is approximately 1,500 ft. long. Closing the west branch at 2:15 p.m. forced the helium to displace the natural gas from the east branch into the main line slightly decreasing the rate of flow between 2:15 and 2:45 p.m. By 2:45 p.m. the high-specific-gravity (0.718) natural gas had caused such a large differential pressure by flow through the orifice of the excess flow valve that it closed this valve, thereby shutting off the flow.

As previously mentioned, the pressure released when the closed valve was bypassed caused the flow to increase and to force the differential pen arm off of the meter chart from 5:10 p.m. until 6:13 p.m.; it also caused the line pressure at the meter to rise during the same period. By 7:00 p.m., the flow rate had returned almost to normal; but just at that time the slug of natural gas reached the meter, and its high specific gravity caused an increase of the differential through the meter from 7:07 p.m., until nearly 7:30 p.m. During the same period, the static pressure decreased a few pounds per square inch. This was caused by the heavier gas being in the vertical well bore. The drop in flow rate at 7:30 p.m. to 1½ in. of water differential was caused by the slug of natural gas reaching the pay zone and causing a greater resistance to flow into the formation. By 8:30 p.m., the natural gas had been forced far enough back into the formation so that flow returned to normal.

The rates of flow, rates of production, and the pipe-line volumes involved completely check the theory of the existence of the natural gas in one branch of the river crossing. The period of time between the closing of the west branch and the tripping of the excess-flow valve and the period of time necessary for the natural gas to pass through the orifice meter at the injection well are practically the same. This would indicate that almost all of the natural gas was through the excess-flow valve before the differential became great enough to close it.

Contractors

Hudson Engineering Co., prime contractors for the construction of the Navajo helium plant, built the Shiprock-Gallup line. The welding was done by the Pressure Weld Co. under a subcontract. Connor-Fowler, pipe-line contractor, built the Amarillo-Exell line, and the Bureau of Mines fabricated all excess flow valves for both lines.



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The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

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Engineering Fundamentals

No. 256

A FEATURE OF THE OIL AND GAS JOURNAL

Stretch of Sucker Rods (Concluded)

Friction forces and damping effects.—The previous article deals chiefly with theoretical principles and more or less ideal relations between the pumping speed of the surface unit and the approximate simple harmonic motion of the pump plunger, together with the effect of pumping speed upon the dynamic load to which the sucker-rods will be subjected.

However, numerous frictional forces are also operative, of which the principal ones are:

1. Friction of rods in the oil.
2. Friction of the oil with walls of tubing.
3. Friction of rod guides—if present—with walls of tubing.
4. Friction between plunger or moving parts of pump and stationary parts.
5. Internal friction of rods as they are alternately stretched and shortened.
6. Viscosity of oil or internal friction of fluid.

Friction of the rods with the oil is important only on the down stroke, when the fluid in the tubing rests on the standing valve and the rods are moving through the oil rather than with it. Friction of the oil with the tubing is important on the upstroke, while friction of the moving parts of the pump with the stationary parts is effective on both up and down strokes. This is also true of the internal friction of the rods. In general, the rate of movement of the oil will be inversely proportional to the viscosity, but it is very probable that the friction factor is a function of the Reynolds number. The viscosity of the oil is inversely proportional to the temperature so that as the oil approaches the surface and the temperatures fall some increase in viscosity would take place, an increase that could be magnified by the escape of gas from solution in the oil.

The motion of the plunger is a type of forced or impressed vibrations which may be considerably modified by the combined frictional forces and effects of the ratio of impressed frequency, f_i, to natural frequency, f_n, of the system. The cumulative results of frictional forces appear in what are called damping effects, which have the tendency to reduce continually the amplitude of vibrations and at the same time lengthen the period of vibration, whether the latter be natural or forced. Due to the fact that damping is always present, free vibrations gradually disappear and forced vibrations remain, sustained by the continuous action of the impressed force; ultimately the motion is that of steady forced vibrations.

The over-all modifying effect upon the disturbing or impressed force takes the form of a magnification factor which is expressed mathematically as follows:

$$\text{Beta} = \frac{1}{\sqrt{(1-\frac{f_i^2}{f_n^2})^2 + \psi^2 \frac{f_i^2}{f_n^2}}} \quad (1)$$

where f_i and f_n are the impressed and natural frequencies respectively, gamma (ψ) is the damping factor, and Beta (β) is called the magnification factor. (See Fig. 1). The damping factor gamma is represented by the expression:

$$\psi = 2\sqrt{1-(f_n/f_i)^2} \quad (2)$$

Where no damping takes place the right hand portion of the denominator of Equation 1 becomes zero. When the ratio of f_i/f_n is very small—i.e., when f_i is much less than f_n—the value of Beta is not very different from unity, but as the ratio of f_i/f_n approaches unity Beta increases very rapidly and when f_i/f_n is equal to one, Beta becomes infinite, which is the condition known as resonance. On the other hand as the ratio of f_i/f_n exceeds unity the value of Beta decreases rapidly, and approaches zero. In such cases the suspended weight tends to stand still.

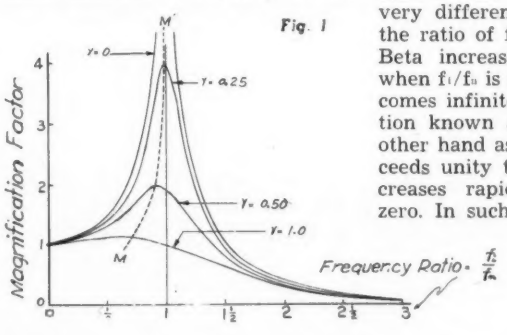
The reader can readily demonstrate this for himself. Take about 10 rubber bands, each approximately 3 in. long, and loop them together to form a rubber string about 30 in. long. Fasten a small weight—4 to 6 oz.—to one end. Call this the **system.**

1. Hold free end of bands in one hand and let weight stretch string.
2. Lower hand until weight just touches floor.
3. Gradually lift upward on the string until weight is about 3 in. from the floor.
4. Give a slight but sudden downward motion to the system and then hold hand still. Observe that the weight will oscillate freely up and down. The natural frequency or number of oscillations per second or minute can be counted. The period is time in seconds to make complete oscillation.
5. Repeat 2 and 3.
6. Move hand holding the system rapidly up and down through a small distance—about an inch will serve the purpose. If the movement of hand is rapid enough so that the impressed frequency is several times greater than the natural frequency the weight will remain practically stationary.

When the impressed frequency f_i is greater than the natural frequency f_n—i.e., above resonance—the magnification factor may be negative, and the displacement therefore opposite in direction to impressed or disturbing force; whereas when f_i is less than f_n—i.e., below resonance—it is in the same direction. Stated another way, above resonance the impressed vibrations are **out of phase** with the disturbing force or source of vibrations, and below resonance the impressed vibrations are **in phase** with the disturbing force.

For oil wells on the pump, damping is of considerable importance. In Fig. 1 it will be seen that for the various values of gamma between 1 and 0, the peak of each curve occurs slightly to the left of the line where $f_n/f_i = 1$ that represents the condition of resonance: hence the maximum values of the magnification factor are, for any value of gamma, slightly below the condition of resonance, or where the value of f_i/f_n is a little less than 1. The shift of the peaks of the damping curves is also greater as the value of the damping factor increases, as shown by the dotted line M-M' in Fig. 1.*

Fig. 1



*Timoshenko, S., and Young, D. H. Engineering Mechanics. 1937. McGraw-Hill.

Series prepared by Dr. E. A. Stephenson, head of petroleum engineering school, University of Kansas

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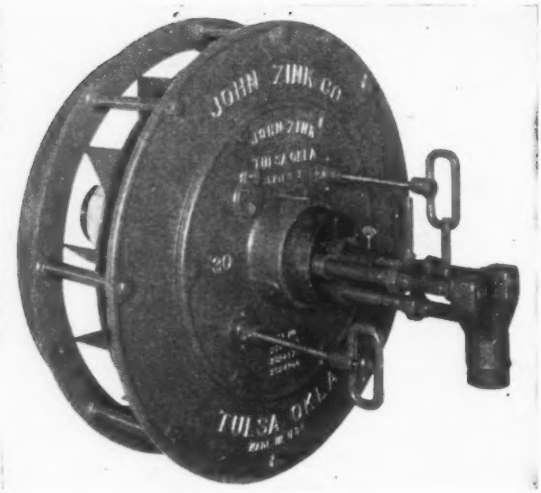

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The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Equivalent Heating Value of Refinery Fuels (See Next Page)

THE heating values, compositions, air required, carbon dioxide in flue gas, and other properties of liquid and gaseous refinery fuels was presented in The Refiner's Notebook No. 105, page 113, August 10, 1946, under the title "Fuel Characteristics." Notebook No. 105 is adequate for combustion calculations but the tabulation on the back of this page is more useful for economic comparisons.

Equivalent Heat

The tabulation on the back of this page is used by reading horizontally across until the "unit" of the fuel is reached. This is normally 1.0—as 1.0 kw., 1.0 gal., 1.0 bbl. or 1 ton, but for gases the unit is 1,000 cu. ft. After having located the column which shows unity, the values in this column (above or below) show the equivalent amounts of other fuels.

Example 1.—One thousand cubic feet of dry natural gas (third material down and third column across) is the equivalent of:

322 kw. electricity
580 cu. ft. wet cracked gas
8.7 gal. gasoline
0.175 bbl. heavy fuel
0.423 bbl. wet acid sludge

Example 2. — One ton of good coal (sixteenth material down and column 16 across) is equivalent in thermal value to:

8,200 kw.
187 M.c.f. producer gas
14.7 M.c.f. wet cracked gas
4.52 bbl. A.S.T.M. fuel 5
0.903 ton petroleum coke

The materials used in the tabulation on the back of this page are indicated (along with other materials) in Table 1. In addition to the regular gross heating values of the fuels, net heating values are shown. This is mentioned because in most furnaces, heaters, kilns, etc., the net heating value is all the heat that can be extracted from the fuel. Only in furnace operations in which the flue gases are cooled to a temperature lower than about 150° F. can the gross heating value be extracted, and complete recovery of the gross heating value is not accomplished unless the flue gases are cooled to the prevailing air temperature. This is not vitally important except possibly in connection with such materials as wet acid sludge (Items 12 and 13) because the net heating value is relatively low, and in connection with petroleum coke or coal because there is little difference between the gross and net heating values of these materials. For these reasons it would possibly be better to have prepared the tabulation on the basis of net rather than gross heating value, but engineers are so accustomed to the gross heating value that any other basis may be confusing. The net heating value is a more direct measure of "recoverable" heat than is gross heating value.

Acid sludge requires special consideration. To produce a suitable fuel it is usually digested with water or dilute alkalies, and it is sometimes mixed with fuel oil. The digested sludge may contain up to 50 per cent water or dilute acid and hence its "as fired" heating value is low. The dry sludge usually has a heating value of 12,000 to 19,000 B.t.u. per lb.

Equivalent Value

The price that can be paid for a substitute fuel can be computed from the values of the tabulation on the back of this page by dividing the cost of the base fuel by the units of substitute fuel required.

Example 3.—Example 1 showed that 322 kw. were the equivalent of 1,000 cu. ft. of dry natural gas. If the cost of gas is 10 cents per M.c.f., the equivalent value of electricity is:

$$\frac{10}{322} = .031 \text{ ct./kw.}$$

or the price you can pay for gasoline (as a fuel)—

$$\frac{10}{8.7} = 1.15 \text{ ct./gal.}$$

or the price of heavy fuel should be under—

$$\frac{10}{.175} = 57 \text{ ct./bbl.}$$

TABLE 1—HEATING VALUE OF REFINERY FUELS

	Approx. H.V., B.t.u.		Heating value on marketing unit	
	Gross	Net	Gross B.t.u.	Market unit
Electricity	3,412/kw.	...	3,412	Kw.
Natural gas, wet	1,300/cu. ft.	1,185	1,300,000	M.c.f.
Natural gas, dry	1,100/cu. ft.	992	1,100,000	M.c.f.
Cracked gas, wet	1,900/cu. ft.	7,740	1,900,000	M.c.f.
Refinery gases, wet	1,800/cu. ft.	1,650	1,800,000	M.c.f.
Refinery gases, dry	1,200/cu. ft.	1,087	1,200,000	M.c.f.
Gasoline (58° A.P.I.)	20,400/lb.	19,000	126,000	Gal.
Furnace distillate (38° A.P.I.)	19,650/lb.	18,450	136,000	Gal.
Fuel oil No. 5	18,500/lb.	17,500	6,200,000	Bbl.
Fuel oil No. 6	18,000/lb.	17,100	6,300,000	Bbl.
Crude oil (30° A.P.I.)	19,200/lb.	18,000	5,900,000	Bbl.
Acid sludge, 20% water or acid	10,000/lb.	9,500	3,500,000	Bbl.
Acid sludge, 40% water or acid	7,400/lb.	7,000	2,600,000	Bbl.
Coke, petroleum	15,000/lb.	14,800	30,000,000	Ton
Coke, cracking still	15,800/lb.	15,500	31,600,000	Ton
Coal, high ash	12,500/lb.	12,100	25,000,000	Ton
Coal, low ash	14,000/lb.	13,500	28,000,000	Ton
City gas (coke oven)	550/cu. ft.	490	550,000	M.c.f.
Producer gas	150/cu. ft.	141	150,000	M.c.f.
Coal tar	16,000/lb.	15,500	155,000	Gal.
Coke (from coal)	12,000/lb.	11,900	24,000,000	Ton
Blast furnace gas	100/cu. ft.	98.5	100,000	M.c.f.

No. 114 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

Equivalent Heating Values (Gross) of Refinery Fuels

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Electricity 3,412 B.t.u./kw.	**1.00** **kw.**	380 kw.	322 kw.	557 kw.	528 kw.	352 kw.	37 kw.	40 kw.	1,820 kw.	1,850 kw.	1,730 kw.	1,030 kw.	760 kw.	9,100 kw.	7,330 kw.	8,200 kw.	161 kw.	44 kw.
2. Natural gas, wet 1,300 B.t.u./cu. ft.	2.62 cu. ft.	**1,000** **cu. ft.**	845 cu. ft.	1,460 cu. ft.	1,390 cu. ft.	924 cu. ft.	97 cu. ft.	105 cu. ft.	4.77 M.c.f.	4.85 M.c.f.	4.55 M.c.f.	2.70 M.c.f.	2.00 M.c.f.	23.9 M.c.f.	19.3 M.c.f.	21.6 M.c.f.	4.23 cu. ft.	115 cu. ft.
3. Natural gas, dry 1,100 B.t.u./cu. ft.	3.1 cu. ft.	1,180 cu. ft.	**1,000** **cu. ft.**	1,730 cu. ft.	1,640 cu. ft.	1,090 cu. ft.	114 cu. ft.	124 cu. ft.	5.63 M.c.f.	5.72 M.c.f.	5.37 M.c.f.	3.18 M.c.f.	2.37 M.c.f.	28.2 M.c.f.	22.7 M.c.f.	25.5 M.c.f.	500 cu. ft.	137 cu. ft.
4. Cracked gas, wet 1,900 B.t.u./cu. ft.	1.8 cu. ft.	683 cu. ft.	580 cu. ft.	**1,000** **cu. ft.**	946 cu. ft.	632 cu. ft.	66.5 cu. ft.	71.5 cu. ft.	3.26 M.c.f.	3.32 M.c.f.	3.10 M.c.f.	1.84 M.c.f.	1.37 M.c.f.	16.3 M.c.f.	13.2 M.c.f.	14.7 M.c.f.	290 cu. ft.	79 cu. ft.
5. Refinery gas, wet 1,800 B.t.u./cu. ft.	1.9 cu. ft.	720 cu. ft.	610 cu. ft.	1,055 cu. ft.	**1,000** **cu. ft.**	667 cu. ft.	70 cu. ft.	75.5 cu. ft.	3.44 M.c.f.	3.50 M.c.f.	3.28 M.c.f.	1.94 M.c.f.	1.45 M.c.f.	17.2 M.c.f.	13.9 M.c.f.	15.5 M.c.f.	306 cu. ft.	83.5 cu. ft.
6. Refinery gases, dry 1,200 B.t.u./cu. ft.	2.84 cu. ft.	1,080 cu. ft.	915 cu. ft.	1,580 cu. ft.	1,500 cu. ft.	**1,000** **cu. ft.**	105 cu. ft.	113 cu. ft.	5.17 M.c.f.	5.25 M.c.f.	4.92 M.c.f.	2.92 M.c.f.	2.17 M.c.f.	25.8 M.c.f.	20.8 M.c.f.	23.3 M.c.f.	458 cu. ft.	125 cu. ft.
7. Gasoline 20,400 B.t.u./lb.	.027 gal.	10.3 gal.	8.7 gal.	15.1 gal.	14.3 gal.	9.5 gal.	**1.00** **gal.**	1.08 gal.	49.0 gal.	50.0 gal.	46.8 gal.	27.8 gal.	20.6 gal.	266 gal.	199 gal.	222 gal.	4.47 gal.	1.19 gal.
8. Furnace dist. (38 A.P.I.) 19,650 B.t.u./lb.	.025 gal.	9.5 gal.	8.1 gal.	14.0 gal.	13.2 gal.	8.8 gal.	.925 gal.	**1.00** **gal.**	45.5 gal.	46.3 gal.	43.4 gal.	25.8 gal.	19.1 gal.	228 gal.	184 gal.	206 gal.	4.05 gal.	1.10 gal.
9. Fuel oil (A.S.T.M.-5) 18,500 B.t.u./lb.	.00055 bbl.	.216 bbl.	.177 bbl.	.307 bbl.	.29 bbl.	.194 bbl.	.86 gal.	.925 gal.	**1.00** **bbl.**	1.015 bbl.	.95 bbl.	.565 bbl.	.42 bbl.	5.0 bbl.	4.03 bbl.	4.52 bbl.	.088 bbl.	.0242 bbl.
10. Fuel oil (A.S.T.M.-6) 18,000 B.t.u./lb.	.00054 bbl.	.206 bbl.	.175 bbl.	.302 bbl.	.286 bbl.	.191 bbl.	.84 gal.	.905 gal.	.985 bbl.	**1.00** **bbl.**	.936 bbl.	.555 bbl.	.41 bbl.	4.92 bbl.	3.96 bbl.	4.45 bbl.	.087 bbl.	.0238 bbl.
11. Crude oil (30 A.P.I.) 19,200 B.t.u./lb.	.00058 bbl.	.22 bbl.	.187 bbl.	.323 bbl.	.305 bbl.	.204 bbl.	.9 gal.	.97 gal.	1.05 bbl.	1.07 bbl.	**1.00** **bbl.**	.595 bbl.	.44 bbl.	5.25 bbl.	4.24 bbl.	4.75 bbl.	.093 bbl.	.0254 bbl.
12. Acid sludge (20% weak acid) 10,000 B.t.u./lb.	.00098 bbl.	.37 bbl.	.315 bbl.	.543 bbl.	.515 bbl.	.343 bbl.	1.51 gal.	1.63 gal.	1.77 bbl.	1.8 bbl.	1.69 bbl.	**1.00** **bbl.**	.91 bbl.	8.85 bbl.	7.15 bbl.	8.0 bbl.	.157 bbl.	.043 bbl.
13. Acid sludge (40% weak acid) 7,400 B.t.u./lb.	.0013 bbl.	.5 bbl.	.423 bbl.	.73 bbl.	.693 bbl.	.461 bbl.	2.03 gal.	2.2 gal.	2.4 bbl.	2.42 bbl.	2.27 bbl.	1.35 bbl.	**1.00** **bbl.**	11.9 bbl.	9.6 bbl.	10.8 bbl.	.222 bbl.	.0577 bbl.
14. Petroleum coke 15,500 B.t.u./lb.	.22 lb.	.042 ton	.035 ton	.061 ton	.058 ton	.038 ton	.004 ton	.0044 ton	.2 ton	.203 ton	.191 ton	.113 ton	.084 ton	**1.00** **ton**	.806 ton	.903 ton	.0177 ton	.0048 ton
15. Coal—high ash 12,500 B.t.u./lb.	.274 lb.	.0325 ton	.044 ton	.076 ton	.072 ton	.048 ton	.005 ton	.0054 ton	.248 ton	.252 ton	.236 ton	.14 ton	.104 ton	1.24 ton	**1.00** **ton**	1.12 ton	.022 ton	.006 ton
16. Coal—low ash 14,000 B.t.u./lb.	.244 lb.	.0364 ton	.039 ton	.068 ton	.064 ton	.043 ton	.0045 ton	.0049 ton	.222 ton	.225 ton	.22 ton	.125 ton	.093 ton	1.11 ton	.893 ton	**1.00** **ton**	.0197 ton	.0053 ton
17. City gas (coke oven) 550 B.t.u./cu. ft.	6.2 cu. ft.	2,360 cu. ft.	2,000 cu. ft.	3,450 cu. ft.	3,270 cu. ft.	2,180 cu. ft.	230 cu. ft.	247 cu. ft.	11.3 M.c.f.	11.5 M.c.f.	10.7 M.c.f.	6.36 M.c.f.	4.72 M.c.f.	66 M.c.f.	46.5 M.c.f.	52 M.c.f.	**1,000** **cu. ft.**	272 cu. ft.
18. Producer gas 150 B.t.u./cu. ft.	22.8 cu. ft.	8,650 cu. ft.	7,330 cu. ft.	12,700 cu. ft.	12,000 cu. ft.	8,000 cu. ft.	840 cu. ft.	910 cu. ft.	41.3 M.c.f.	42.0 M.c.f.	39.4 M.c.f.	23.4 M.c.f.	17.4 M.c.f.	206 M.c.f.	167 M.c.f.	187 M.c.f.	3,660 cu. ft.	**1,000** **cu. ft.**

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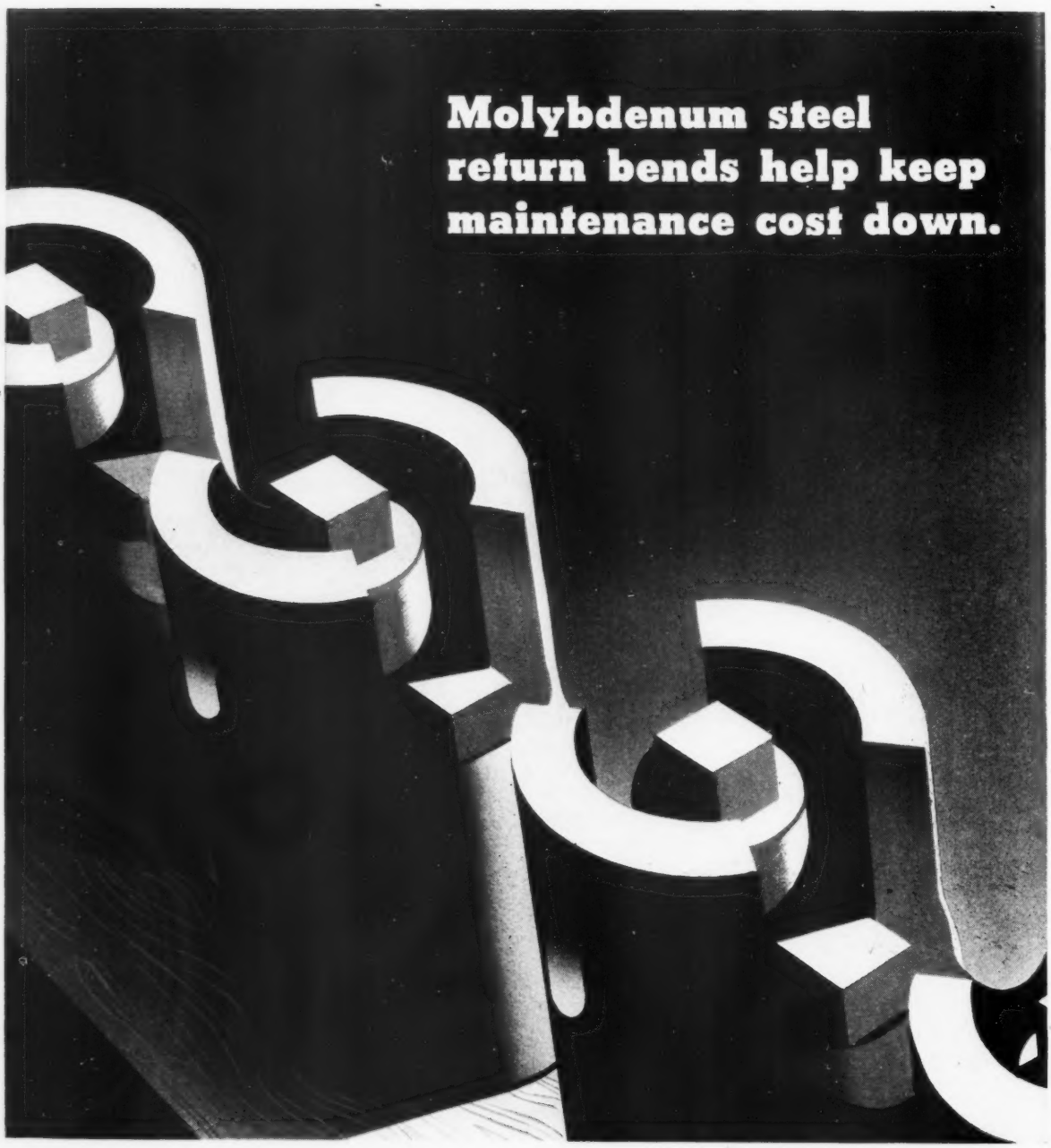

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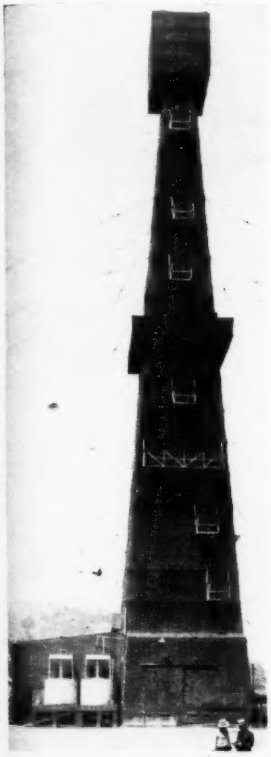
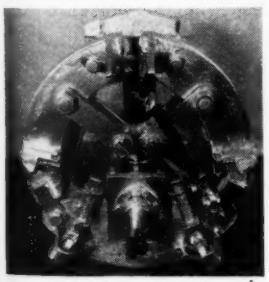
OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

by Kenneth B. Barnes





(1) VACULITE DERRICK COVERS make it possible to "drill anywhere . . . any time!" insofar as cold, high winds, bad weather, proximity to residential areas, and other conditions are concerned. These weatherproofing, soundproofing, and flameproofing derrick "overcoats" come in sections and are quickly installed with patented hooks and pins. At Point Barrow, Alaska, these greatly extended working time possible in the cold, short daylight periods. *Vaculite Products Co.*

IT'S NEW CHECK IT

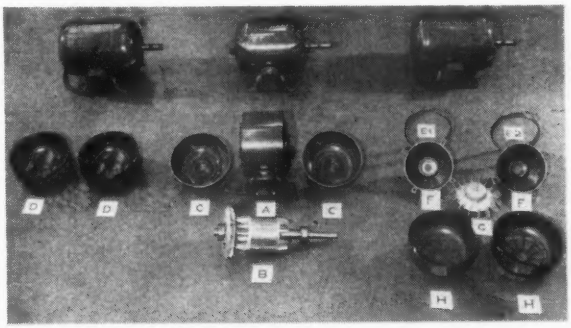
(2) SUPERIOR LINE-UP CLAMP is new product for pipe-line construction that gives better pipe alignment with greater speed and reliability, eliminates stringer-bead cutouts due to misalignment. Mechanically actuated, an outstanding feature is that it need not be removed from the pipe when once placed in operation, but rather, is drawn forward through the pipe to make each consecutive alignment. Users are enthusiastic of the results obtained and the clamps currently are on several large 18, 24, and 26-in. construction jobs. Two contractors are averaging better than a mile of 24-in. construction per 10-hour day. *Superior Welding & Machine Co.*

(3) FORGED GASKETS for valves, valve bonnets, and flanged connections are now manufactured for high-pressure and high-temperature pipe-line use wherever ready disassembly is a necessity. Forged of different metals to

meet the requirements of different service conditions, these ring gaskets provide connections by wrench pressure, as tight as a weld. Available in oval and octagon types, in wide range of sizes. *The Steel Improvement & Forge Co.*

IT'S NEW CHECK IT

(4) NEW LIFE-LINE A.C. MOTORS are more than 35 per cent smaller than predecessors. Starting torques are increased as much as 134 per cent per pound of motor, max-



imum torques increased as much as 116 per cent per pound. High efficiencies and power factors are maintained. Shock resistance is increased, features new insu-

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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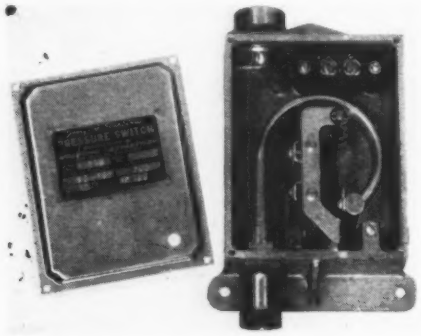
lating materials and improved winding techniques. Use of steel frame adds strength. Photo shows interchangeability of basic subassemblies and parts for three different Life-Line motor sizes. *Westinghouse Electric Corp.*

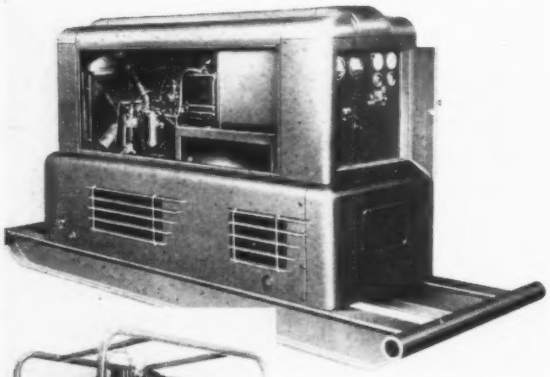
IT'S NEW CHECK IT

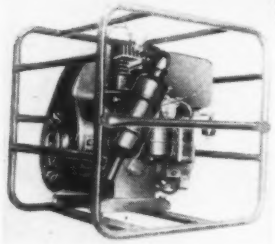
(5) 310 MELETRON-STARBIRD pressure-operated switch may be adjusted externally without removal of cover or disturbing mounting. Operates within 20 to 3,000 psi (complete line has several ranges) and also has overload



capacity. Entire unit fitted in rugged aluminum corrosion-resistant case; carries electrical rating of 10 amp. at 125 volts. Readily installed, connects to ½-in. threaded conduit, screw terminals enclosed in housing. Many applications possible for safeguarding equipment and processes. *Meletron Corp.*

IT'S NEW CHECK IT

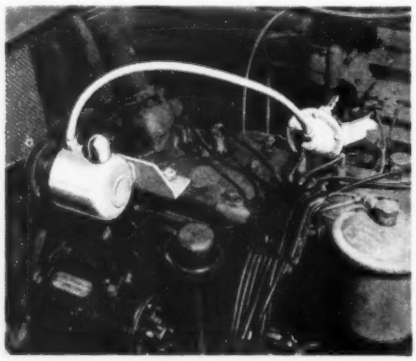




(6) ONAN ELECTRIC GENERATORS, from the small to the large, are specifically designed and built for oil-field service. The 350 and 1,000-watt units are easy starting, have combination guard-and-carrying frames, accessible outlet boxes, and provide on-the-spot lighting needs. The larger 3,500, 6,000, and 10,000-watt units likewise are built to petroleum-industry specifications: Compound-wound generators, sturdy but streamlined steel housings, steel skid bases, gas-gasoline carburetion, protective cutouts, push-button and remote starting. *D. W. Onan & Sons.*

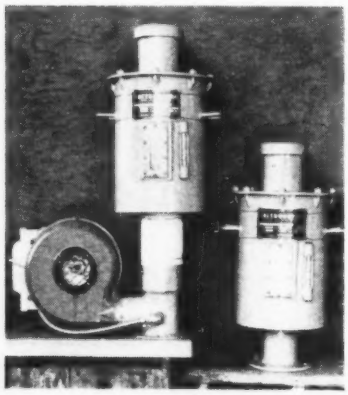
IT'S NEW CHECK IT

(7) NEW HYDRAULIC GOVERNORS combine the time-honored principles of hydraulics and centrifugal force. There are four standard types: Automotive, constant speed, overspeed shutoff, and universal. Illustrated is



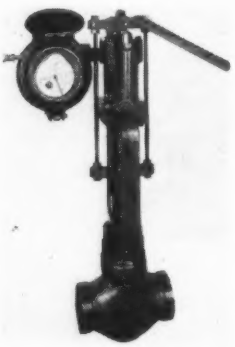
automotive type which gives effective engine control, maximum sensitivity, and efficiency without loss of power. Adapted to any gasoline or diesel motor, available in all standard sizes, tamper proof. *Milwaukee Lock & Mfg. Co.*

IT'S NEW CHECK IT



(8) ELECTRO-BREATHERS prevent atmospheric moisture from entering storage tanks. Are mounted directly over a tank's vent or in piping to it. Incoming air is dried by its passage through activated aluminas contained in the breather. Breathers are equipped with a color indicator for showing when reactivation is needed and when reactivation is complete. Breather at left is being reactivated by electrical unit. Prevents corrosion, pollution, "off-standard" tank contents. *Pittsburgh Lectrodryer Corp.*

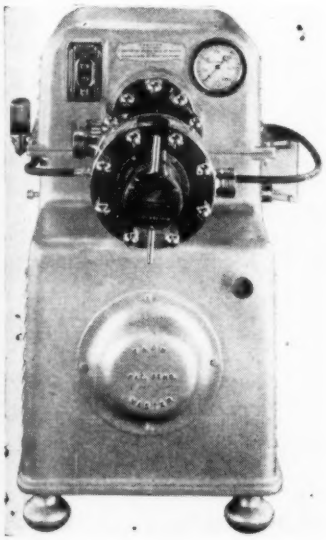
IT'S NEW CHECK IT



(9) "CLOCK UNIT" SHUTOFF is a complete new valve unit that closes automatically after a preset time. Designed for closing in flowing wells, it also has many other applications in switching and routing fluid movements in isolated operations. Valve body has 1,500-psi. - working - pressure rating. At the top is a hydraulic cylinder pump for manually opening the main valve. The clock-actuated pilot valve bypasses hydraulic fluid from the cylinder to the top side of the pis-

ton, permitting main valve to close by spring force. Speed of closing is controlled by metering screw in the fluid bypass. A complete unit, it needs no outside pressure supplies for operating. *Enardo Foundry & Manufacturing Co.*

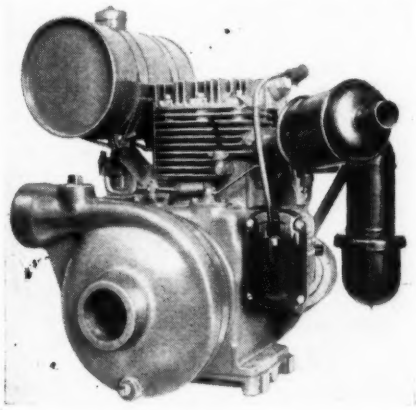
IT'S NEW CHECK IT



(10) FLOW-MASTER HOMOGENIZERS are a distinct departure from convention, in both design and performance, in processing greases and blending oils. Combines the functions of an homogenizer and a colloid mill. The various entering oils, soap stocks and additives first pass through a compounding chamber where the components are uniformly combined. They are then forced forward along the shaft between the rotor and stators where the milling action takes place. The oils are uniformly dispersed to produce a grease of superior quality. For blending, a homogeneous product is made by means of a mechanical compounding principle, the blends are under pressure, and viscosities of the finished products are controlled accurately. *Marco Co., Inc.*

IT'S NEW CHECK IT

(11) EMPCO "ENGINPUMPS" feature only one moving part, the all-bronze impeller. Close-connected design eliminates gears, belts, chains, couplings. No relief or bypass valves. Impeller is rigidly keyed to engine shaft

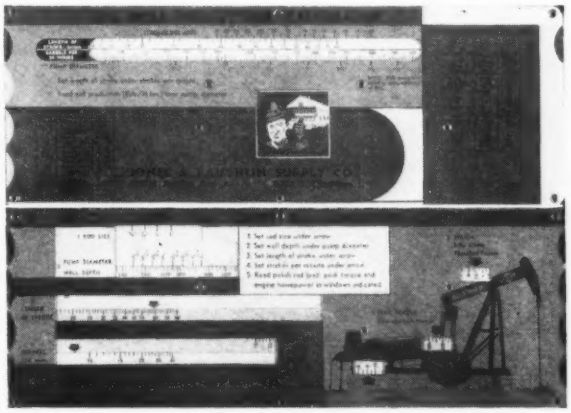


and revolves within the pump casing with large clearances. Volute casing contains both suction and discharge nozzles, its removal gives complete access to the pump impeller. Many applications on rigs, leases, different jobs around plants. *Maryland Products Co.*

IT'S NEW CHECK IT

OIL AND GAS EQUIPMENT Digest — IT'S NEW CHECK IT

(12) J & L PUMPING CALCULATOR, sent free to operators and engineers handling oil-well pumping problems, is one of handiest and most convenient specialized slide rules available. Both sides of the calculator have scales and movable slides which set forth full range of: rod size,



pump diameter, well depth, length of stroke, strokes per minute, polished-rod load, peak torque, engine horsepower, and production per 24 hours. Quick solutions of many pumping problems can be made. In addition, detailed data and ratings of Cabot unit pumpers are given. *Jones & Laughlin Supply Co.*

IT'S NEW CHECK IT

(13) SPECIAL TUBE EXPANDER reaches through length of the tube to roll the far end—solves retubing problems where boiler construction does not permit usual access. Eliminates climbing into the fire box to reach the inside

ends of the lower pass tubes. Avoids dismantling the outer boiler jacket or cutting through this jacket with an acetylene torch to gain access to all tubes. Expander enters from the smoke box, or fire door. Revolving stop collar permits adjustment for various length of tubes. *Richard Dudgeon, Inc.*

IT'S NEW CHECK IT

TRADE LITERATURE

(14) DUPLEX TUBING. A revised edition of technical bulletin dealing with corrosion problem occurring when tubing is attacked simultaneously inside and outside by two different types of corrosive media. Bulletin also contains drawings illustrating methods of installations. *Bridgeport Brass Co.*

IT'S NEW CHECK IT

(15) STANDARD PYROMETER SUPPLIES GUIDE. Booklet presents concise information to purchasing agents and

instrument men on how to order thermocouples, protecting tubes, thermocouple wires, lead wire, insulators, etc. Also contains complete descriptions and prices on various types of standard thermocouples. *Brown Instrument Co.*

IT'S NEW ✓ CHECK IT

(16) AUXILIARY COMBINATION POWER UNIT. New brochure describing how a rig-lighting plant, electric-welder accessory drive for wash down pump, and air compressor unit have been engineered and built into one compact movable unit. Folder pictures complete unit and explains salient features. Also lists engineering data. *Stewart & Stevenson Services.*

IT'S NEW ✓ CHECK IT

(17) PIPE AND FITTING MATERIALS are summarized in handy chart providing a quick reference source for A.S.T.M. and other specifications, chemistry, service temperature limits, welding data and types of steel. Folds to 8½ by 11 in. for filing on ring binders. *Tube Turns, Inc.*

IT'S NEW ✓ CHECK IT

(18) TUBE EXPANDERS. Four-page pamphlet illustrates this manufacturer's line of tube expanders and cutters. Cutaway sections of expanders for all uses show construction details. *The Gustav Wiedeke Co.*

IT'S NEW ✓ CHECK IT

(19) CONDENSER TUBES. New brochure includes selector tables, tells about copper, brass and copper-base alloys and their chemical and physical characteristics as applied to condenser and heat-exchange use. Contains graph giving safe working pressures. Two pages are devoted to estimating data. *Wolverine Tube Div. Calumet & Hecla Consolidated Copper Co.*

IT'S NEW ✓ CHECK IT

(20) PORTABLE POWER. New four-page pamphlet shows application of portable gasoline-engine-driven generators. On-the-job photographs illustrate the uses of these portable units. *Homelite Corp.*

IT'S NEW ✓ CHECK IT

(21) "HOW TO FIND LONG LIFE." New 44-page booklet for buyers of nickel-alloy parts and accessory equipment. Describes 188 separate items, from special tower packing to nonsparking safety tools, and lists the name and address of each manufacturer. *The International Nickel Co.*

IT'S NEW ✓ CHECK IT

(22) FILTERS FOR GASES AND LIQUIDS. Booklet describes general fields of application, filtration efficiency, filtration of air and oil for internal combustion engines and compressors. Booklet is pocket size. Illustrated. *Drico Industrial Corp.*

IT'S NEW ✓ CHECK IT

(23) FIRE-PROTECTION HANDBOOK. How to fight fires and protect property graphically explained. Illustrates latest techniques in fighting fires with carbon dioxide and other type fire extinguishers. Photographs and diagrams indicate fire hazards, employe mobilization for defense, approved methods of operation for different type extinguishers. *Randolph Laboratories, Inc.*

IT'S NEW ✓ CHECK IT

(24) INDUCTION MOTOR. New bulletin covers fully the construction, features and typical applications of protected-type standard squirrel-cage induction motor. *The Louis Allis Co.*

IT'S NEW ✓ CHECK IT

(25) GASKETS. Spiral wound, metal and asbestos gaskets completely illustrated and described in new catalog covering entire line. Has gasket engineering reference tables and comprehensive data on sizes and shapes as well as other pertinent gasket information. *United States Gasket Co.*

IT'S NEW ✓ CHECK IT

(26) GAGES. A 24-page catalog punched to fit ring binders gives full information on line of precision gages for pressure, vacuum, ammonia, low and high-pressure and hydraulic. Shows wide selection of styles, sizes and materials. Catalog gives dimensions, has cutaway drawings and lists prices. *Weksler Thermometer Corp.*

IT'S NEW ✓ CHECK IT

(27) MOTOR CONTROL. A 20-page, three-color booklet of interest to motor users gives the how and why and when and what of modern synchronous motor control. *Electric Machinery Mfg. Co.*

IT'S NEW ✓ CHECK IT

(28) CONTROL VALVES. A 44-page catalog pictures line of control valves along with a considerable amount of engineering data. Is well-illustrated and has been prepared for use of instrument engineers, process technicians and draftsmen. Covers selection, dimensions, weights, construction. *Mason-Neilan Regulator Co.*

IT'S NEW ✓ CHECK IT

(29) AIR CLEANERS. A 30-page catalog, punched for fitting ring binders lists line of air cleaners. Includes specification chart, selection guide and service instruments. Profusely illustrated. *Donaldson Co., Inc.*

IT'S NEW ✓ CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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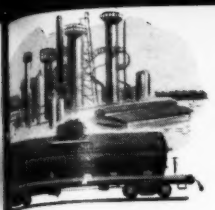
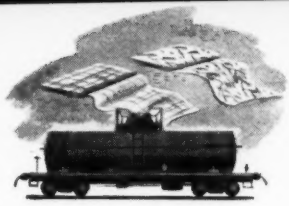


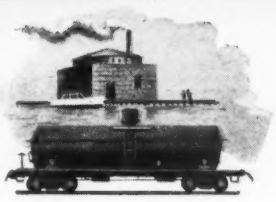
ALCOHOL

steel car, 6,000 to 10,000 gallon capacity.



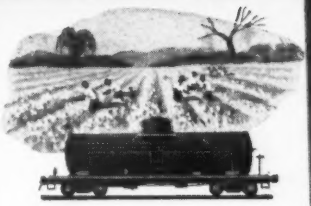
CAUSTIC SODA

Heavily insulated steel car, with or without heater coils, 8,000 or 10,000 gallon capacity. Usually specially lined.



CHLORINE

Insulated, welded car; built to withstand pressure up to 500 pounds; 15 or 30 ton capacity.



COTTONSEED OIL

Clean, steel coiled car of 8,000 gallon capacity.

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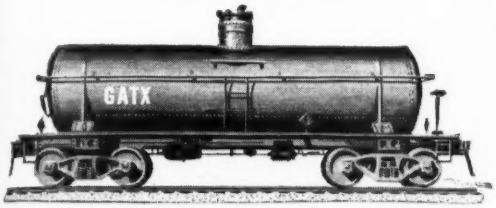
TANK CARS



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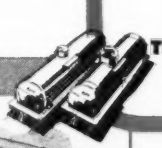

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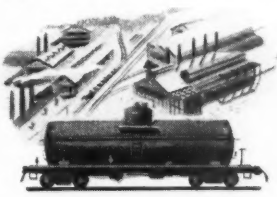
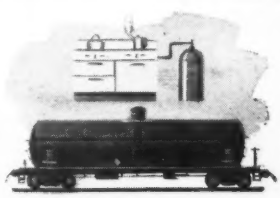


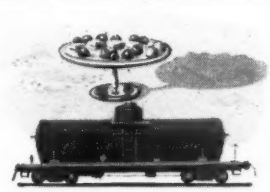
FUEL OIL

Steel car, steam coiled, 8,000 to 12,500 gallon capacity



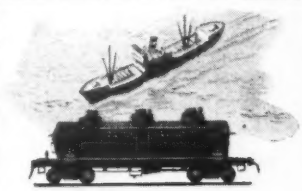
PROPANE

Heavily constructed car, welded and insulated. Built to withstand internal pressures to 300 pounds. Capacity 10,000 to 11,000 gallons.



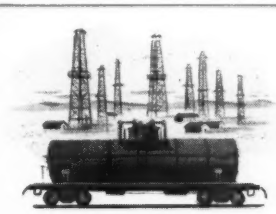
CORN SYRUP UNMIXED

Clean, steam coiled with heavy truck capacity. Usually lined with aluminum paint.



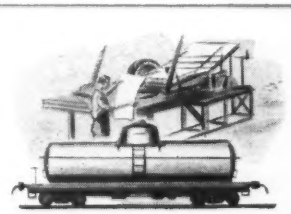
LUBRICATING OIL

Steel car, with steam coils, single or multiple compartment; usually 8,000 gallon capacity.



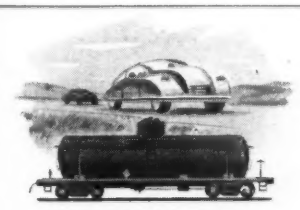
MURIATIC ACID

Car lined with pure or synthetic rubber; 8,000 to 10,000 gallon capacity.



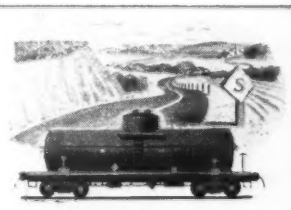
ACETIC ACID

Aluminum Car, 8,000 or 10,000 gallon capacity.



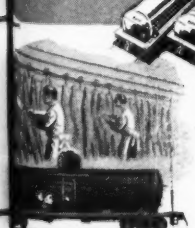
GASOLINE

Clean car, 6,000 to 12,500 gallons; single or multiple compartment.



ASPHALT OR TAR

Heavily steam coiled car; with 2 or more inches of insulation; steam jacketed outlet; 8,000 to 10,000 gallon capacity.



LARD

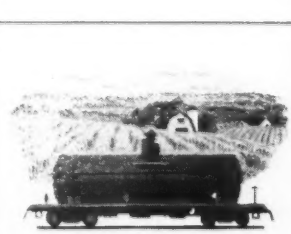
coiled car, usually of 8,000 gallon capacity.

WINE

Insulated car with one to six compartments. Interior coated to preserve quality.

MOLASSES

Steam coiled car with heavy capacity trucks; 8,000 gallon capacity.



SULPHURIC ACID

Heavily constructed steel car with heavy truck capacity. Equipped to unload through dome.

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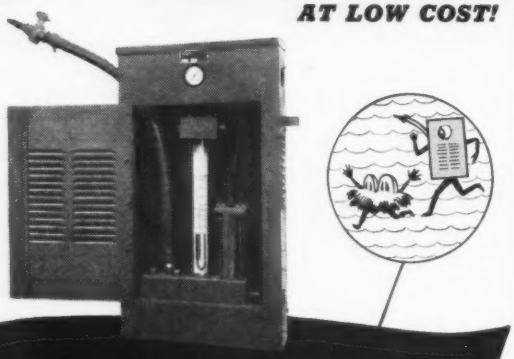
AT LOW COST!



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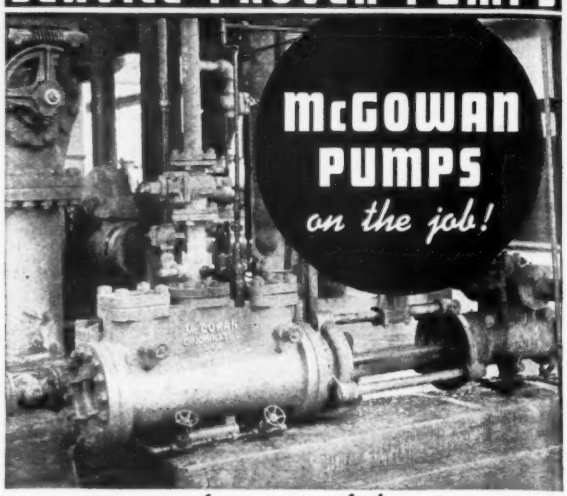

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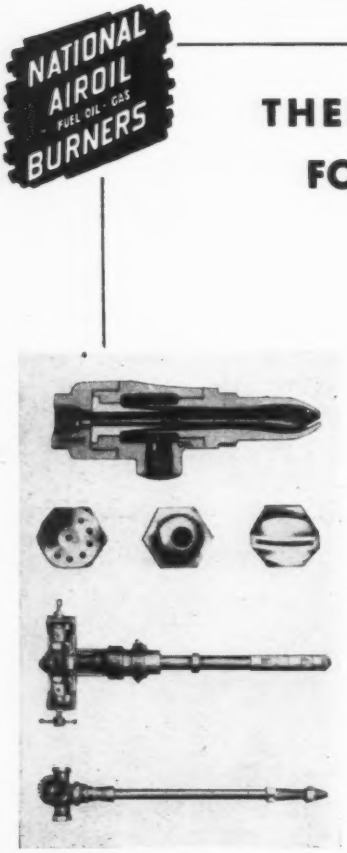

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REFINING

Texas Co. Outlines Work Planned for Tulsa Plant

The Texas Co. last week made public additional information on improvements planned for its West Tulsa refinery as a part of a general pipe-line and refinery expansion program announced earlier (The Oil and Gas Journal, October 5, page 38).

The West Tulsa plant will be virtually rebuilt, with the work to cost "several millions," company officials said. Present shell stills will be replaced with modern new pipe stills with a capacity of 30,000 bbl. daily, 8,000 bbl. more than at present.

Also to be installed are a fluid catalytic-cracking unit, a catalytic polymerization unit, an acid-treating and sweeting plant, additional steam-generating and distributing equipment, and cooling-water and other auxiliary facilities.

The company's earlier announcement disclosed it is studying a 20-in. crude line which may be built with other interests from Midland, Tex., to Cushing and which would result in additional crude being available to the West Tulsa plant as well as to refineries in Illinois.

California Aviation-Gasoline Refinery Placed on Market

WASHINGTON.—A 100-octane aviation-gasoline refinery, capable of producing 8,000 bbl. per day, which can be converted to the production of commercial grade gasolines or chemicals, is being offered for sale or lease, War Assets Administration announced last week.

The plant, formerly operated by Standard Oil Co. of California, located in Contra Costa County about 12 miles north of San Francisco and 3 miles northwest of Richmond, comprises three tracts of land totaling 40 acres. Total cost to the government was $21,348,000.

German Report Describes Sulfating Lower Olefins

WASHINGTON. — Development of a process for sulfating lower olefins recovered from waste gases enabled a German war plant to achieve a yield of 2,600 tons of mixed alcohol in 1943, according to a report now on sale by the Office of Technical Services, Department of Commerce.

The plant, part of Treibstoff Werk Rheinpreussen near Duisburg, was the only one engaging in this operation in Germany. The report, which also describes the conversion of the alcohols into acetone and methyl ethyl ketone in this plant, was prepared by investigators of the British intelligence objectives subcommittee. Raw materials for the synthetic production of alcohols were obtained from low-boiling point hydrocarbons in waste gases from a Fischer-Tropsch plant processing coal into oil at Treibstoff.

Another German industry report available from the department deals with developments in the production of chlorine. American experts found that the horizontal, mercury-type chlorine cell was the predominant design used by I. G. Farbenindustrie both for the production of chlorine and 50-70 per cent high-grade caustic soda.

Description of a German battery-ignition system and of a new engine claimed to consume less than ⅓ lb. of fuel per horsepower-hour, are contained in two other reports on file at the department. The ignition system was reported to furnish a hot, prolonged spark of particular value in diesel engines burning solid fuel. The theoretical thermodynamic process of the new engine was discussed generally in the British-prepared report on this development.

Jefferson Chemical Building Ethylene Glycol Plant

NEW YORK. — Construction work is well under way on Jefferson Chemical Co.'s first plant at Port Neches, Tex., according to P. M. Dinkins, Jefferson president. The plant will make

WANTED

500,000 tons
PETROLEUM COKE
A YEAR (4-5 CARGOES A MONTH)
15,000 BTU; ash 2-4% (approximately) passing between 0 and 3/5 inch, less than 25% smaller than 1/25 inch.

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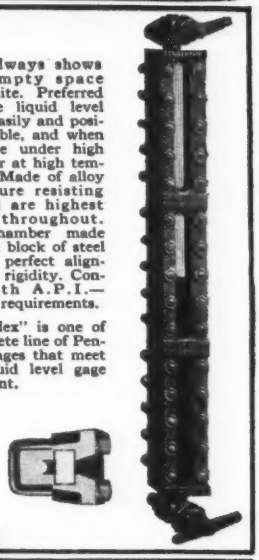

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Of interest in the production of organic fluorine compounds, and in the synthesis of other organic compounds.

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ethylene glycol and ethylene oxide as its first products.

The plant is expected to be in operation in the summer of 1947, Dinkins said. Construction is being handled by the Lummus Co. and E. B. Badger & Sons Co. The chemical company has a laboratory in New York and a pilot plant in Texas which are active; operators for the main plant are being trained at this pilot plant and will take over when the plant is completed.

Jefferson Chemical Co. is owned jointly by The Texas Co. and American Cyanamid Co. to make chemicals from petroleum hydrocarbons. Ethylene glycol is used widely as an antifreeze in radiators, as brake fluid, for making cellophane, various resins, cosmetics, and other products. Ethylene oxide is used as an intermediate in many chemical syntheses.

Death Toll, Damage Heavy In Sun Refinery Disaster

MARCUS HOOK, Pa.—Seven persons were killed and at least 140 others injured last week in a disastrous fire and explosion at Sun Oil Co.'s aviation-gasoline refinery here.

The fire, accompanied by a series of explosions, was caused by a packing gland which failed and allowed gas to escape and flash, according to Arthur E. Pew, Jr., Sun vice president. Damage was estimated at $300,000.

Flames spread from a pump room to a 125-ft. fractionating tower which collapsed, throwing burning gasoline over many fire fighters. Some of the subsequent explosions were felt in Philadelphia, 20 miles away. The plant is considered the world's largest alkylation unit.

Tankers at the company's wharves along the Delaware River quickly pulled away during the fire to avoid sparks which threatened their cargoes. One of the injured, Nelson King, general foreman of the plant, said "when the explosion occurred, the cracking tower simply disintegrated. That blew apart the small building I was in. A ball of fire just seemed to roll around and hit and ignite every building."

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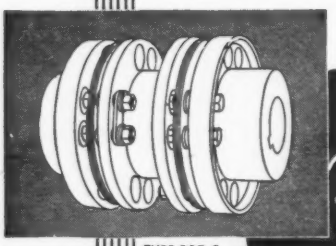

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NO LUBRICATION IS REQUIRED!

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Manual Issued Covering Caustic-Soda Unloading

A revision of its manual sheet, TC-3, covering the unloading of unlined, lined, and specially insulated tank cars containing liquid caustic soda or caustic potash, has been issued by the Manufacturing Chemists Association.

The association said the primary purpose of the manual was to cover improved methods of unloading and handling the 71-73 per cent grade of liquid caustic soda now shipped in specially lined and insulated cars. The manual is available at the association's Washington office at 15 cents per copy.

Another publication, Chemical Safety Data Sheet SD-4, covering safe handling and use of phenol, has been prepared by the association and is available at the Washington office for 20 cents per copy.

Large Compressors Built

NEW YORK.—Two of the largest sulfur dioxide compressors have been built and shipped by the Carrier Corp. to Standard Oil Co. of California for use in the handling of sulfur dioxide in a refining process. Each compressor is of centrifugal design, operates at 9,840 r.p.m., and uses 633 hp. with four impellers, steam turbine-driven. These compressors are the first of their type made in the United States.

New Canadian Terminal

VANCOUVER, B. C.—Work is under way at the new terminal of McColl-Frontenac Oil Co. at Barnet, on the upper Burrard Inlet near Vancouver. Preliminary construction is expected to be completed this year. The projected terminal includes four large and six smaller tanks and wharves capable of handling ocean-going tankers. The installation will be equipped to handle more than 3,500,000 gal. of fuel.

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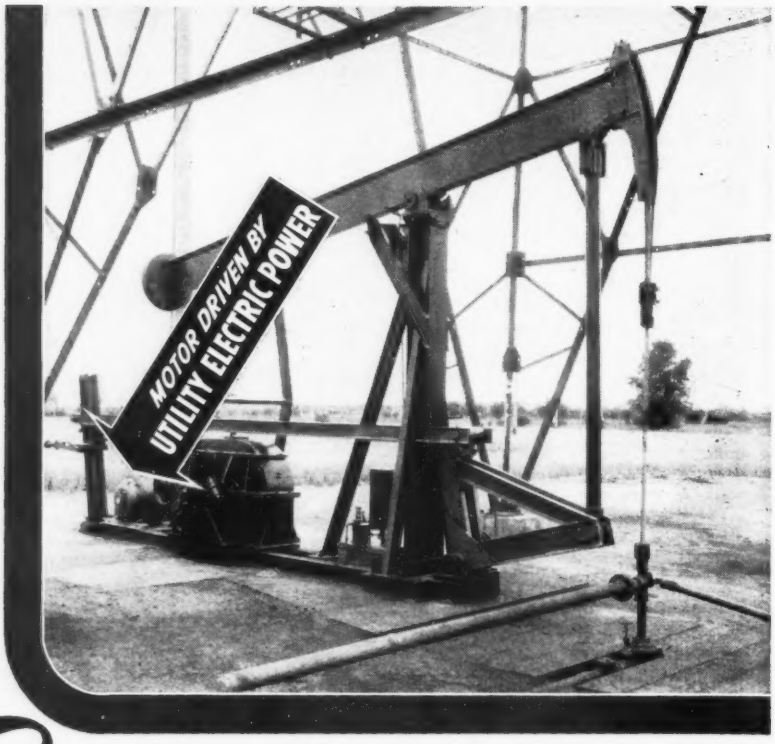

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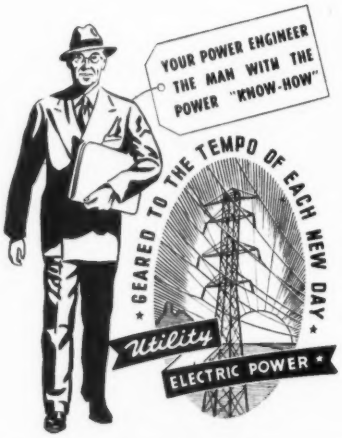

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Box 1498, Oklahoma City, Oklahoma

PIPE LINES

Producers Pipe Line Buys Mink Island Pool Interest

MOUNT VERNON, Ind.—Producers Pipe Line Co., a subsidiary of Louisville Refining Co. and the Ohio Farm Bureau Cooperative, has bought interests in the Mink Island pool in the Wabash River from three operators.

The properties were sold by Ira Van Tyul and V. J. Gallagher, both of Mount Vernon, and D. M. Heath, Carmi, Ill., who had held one-half working interest in the pool. Included were producing wells on Mink Island and two wells drilled beneath the river bed on state leases. Sale price was not revealed.

A.I.M.E. Group Hears Talk On Cathodic Protection

LOS ANGELES.—The reduction in pipe-line corrosion failures made possible by cathodic protection was illustrated in two case histories presented by Dr. Gordon Scott, consulting engineer, in a recent talk at a meeting of the junior section of the Pacific Coast Petroleum chapter of the American Institute of Mining and Metallurgical Engineers.

Dr. Scott's case histories showed failures before and after the installation of cathodic protection. In his discussion, he said the three elements of cathodic protection are the line, the power source, and the anode. Each installation is different, and power requirements vary widely, he added.

A protective coating is a great aid in reducing the power requirement of cathodic protection, he continued. Scrap iron has been used for anodes, but this has to be replaced periodically. Graphite anodes have been tried and give promise of indefinite life. Since statistically, the number of pits plotted against time gives a parabolic curve, the number of future failures of a pipe line can be predicted after some history has been accumulated, he said.

Guides to corrosiveness in the well-drained soils of eastern United States are pH and total acidity, Dr. Scott said, whereas in the poorly drained alkaline soils of western United States resistivity is a measure of corrosiveness. The speaker said the presence of anaerobic bacteria which produce H_2S as a byproduct of the life process results in rapid corrosion of steel.

Although long-life currents are measurable in pipe lines, they account for only 5 to 15 per cent of the total galvanic action, and local currents, largely those which flow between the top and bottom of the pipe, account for the remainder. When lines cannot be routed away from corrosive areas or laid above ground, coating is applied to the pipe and becomes important in determining its length of service.

Montana-Dakota Utilities to Build New Gas Line

WASHINGTON. — The Federal Power Commission announced last week that it had authorized the Montana-Dakota Utilities Co., Minneapolis, to construct 28½ miles of 10¾-in. gas-transmission pipe line in Valley County, Montana, at an estimated cost of $280,000.

The proposed line, the company said, will parallel an existing 8-in.

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PIPE LINE SUPPLIES

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Koehring Backhoes and Draglines

Heavy Bucyrus-Erie Bulldozers and Graders

Schramm Air Compressors and Air Tools

Hand Tools and Supplies

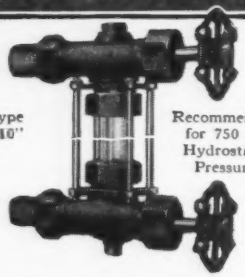
CLARENCE L. BOYD CO.

TULSA, OKLA. L.D. 745

OKLAHOMA CITY

GUTHRIE, OKLA.

PENBERTHY
DROP FORGED STEEL
LIQUID LEVEL GAGES



Steel construction throughout with stainless steel interior trim. Automatic shut-off is positive and instantaneous; stainless steel balls shut off the flow of liquid when glass breaks. Heavy duty stuffing boxes, union connections, offset construction facilitate cleaning and simplify glass replacement. Conform with A.P.I.—A.S.M.E. requirements.
This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

PIPELINE PERFECTION
IS THE RESULT OF
80 Years EXPERIENCE
AMONG OUR THREE KEY MEN
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A CONTRACT WITH MB MEANS "PIPELINE PERFECTION"
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MORRISON BROS. CONSTRUCTION COMPANY INC.
GENERAL PIPELINE CONTRACTING
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line and will transport additional natural gas for distribution in communities now served by the company, and carry gas from Bowdoin field during summer off-peak periods for repressuring and storing in Baker-Glendive field to be withdrawn for use during peak periods. This method of operating would, it was claimed, offset the effect of declining rock pressure in the Baker-Glendive field.

Eminent-Domain Right Advocated for Gas Lines

WASHINGTON.—The Federal Power Commission was asked last week to recommend federal legislation giving gas-transmission companies the right of eminent domain to acquire pipe-line rights-of-way for projects approved by FPC.

The suggestion was made by Warren T. Spies, Chicago, attorney for Natural Gas Pipeline Co. of America who acted as an individual in filing a statement before FPC in response to the commission's request for summaries from participants in its investigation of the natural-gas industry.

Lack of such eminent domain legislation often leads landowners to make exorbitant demands on companies for easements, he said. Pipe-line construction, he added, is thus penalized at ultimate cost to the consumer. Gas pipe-line companies are required to obtain a certificate for new construction, he said, but at the same time, are not given "appropriate means for effectuating the construction" found to have the status of public convenience and necessity.

Panhandle Eastern Plans New Compressor Units

WASHINGTON. — The Federal Power Commission has received a request from Panhandle Eastern Pipe Line Co. for authorization to install eight additional compressor units aggregating 12,200 hp. in eight of the compressor stations along the company's pipe-line system which extends through Texas, Kansas, Missouri, Illinois, Indiana, Ohio, and Michigan. Estimated cost is $2,685,000.

Pipe-Line Tax Receipts Show Decline in August

WASHINGTON.—The tax on transportation of oil by pipe line netted the U. S. Government $1,168,799.30 in the month of August, about 8 per cent less than in the same month of 1945.

July collections of $1,392,506 also were higher than the August 1946 receipts from the pipe-line tax. The total for August 1945 was $1,268,773.97.

Kansas Runs Decline

WICHITA, Kans. — Pipe-line runs of Kansas crude averaged 267,349 bbl. daily in the week ended September 30, dropping for the first time since August 12 below the 270,000-bbl. daily allowable fixed by the state Corporation Commission. Runs for the final week of September were 8,612 bbl. below the average for the previous week, according to the conservation division of the commission.

WHEN THE GOING GETS TOUGH AND THE TRENCHING HARD....

THEN MORE THAN EVER YOU NEED A CLEVELAND

In CLEVELANDS from the husky Gasoline or Diesel power plant to the high-capacity digging wheel you will find a toughness, and a protection from wear to an unsurpassed degree. This extra ruggedness in Clevelands enables them to take the toughest trenching jobs in stride.

THE CLEVELAND TRENCHER CO.
20100 ST CLAIR AVE CLEVELAND 17 OHIO

C. S. FOREMAN COMPANY
General Contractors
PIPE LINES
217 Railway Exchange Building
Kansas City 6, Missouri

UNIBOLT now offers a complete, pre-tested CHRISTMAS TREE flow manifold

Here is a complete, pre-tested unit, available in tee or cross type—6,000 - 10,000 - 15,000-lb. test, which makes use of UNIBOLT Adjustable Wing Valves instead of ordinary plug or gate valves.

The UNIBOLT fitting on top of the tree simplifies running pressure bombs or paraffin scrapers and can be provided flanged or threaded in any size combination required. The remainder of the assembly is 2-inch. A UNIBOLT choke body, fitted with positive bean and bleeder type blanking plug, provides dependable, trouble-free flow control. Low velocity and therefore non-cutting flow thru the adjustable wing valve is assured, since the flow is usually through a small orifice in the positive bean installed beyond the wing valve. The opening in the wing valve is 1-inch. It can be completely repaired "on the job", including replacement of stem and seat. Its parts are interchangeable.

All connections in the flow manifold are standard forged steel UNIBOLT couplings which provide complete interchangeability, greater strength, less weight and higher efficiency. For extreme abrasive conditions, or for long, trouble-free life, hard chrome stems and seats are available.

THORNHILL-CRAVER COMPANY
HOUSTON

UNIBOLT
THE ONE BOLT COUPLING

COLUMBIA SERVES . . .

A Great Part of the Country

The territory served by the Columbia System thrives on industry, commerce and agriculture. It is a *great* part of the country.

We believe firmly in its future.

And we are backing our belief by investing approximately $56,000,000 more—adding it to the $450,000,000 already invested in the plants and equipment of the System—to expand our facilities for service.

The $56,000,000 construction program has been started by the subsidiaries of the Columbia Gas & Electric Corporation. In a little more than two years, there will be added to the System:

More than 500 miles of new pipeline

Four new compressor stations

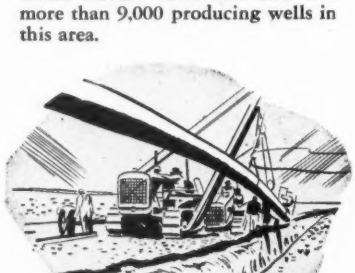
A new storage field and the enlargement of others

Nine new propane-air gas plants

Approximately 1,000 new gas wells . . .

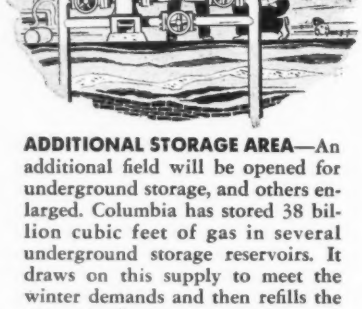
. . . to meet the growing requirements of homes, industries and commercial enterprises in the great area served by the Columbia System.

NEW GAS WELLS—More than 1,000 new wells will be drilled, seeking new supplies of gas in the Appalachian fields. Columbia now has more than 9,000 producing wells in this area.



NEW PIPELINES—More than five hundred miles of large-size pipeline will be added to the System to facilitate the flow of more gas.

NEW COMPRESSOR STATIONS — Four new compressor stations, strategically placed, and additions to others. Compressors maintain the pressure behind the gas flame, help pump gas brought to Columbia from the rich Texas fields to augment supplies from fields in Ohio, Pennsylvania and West Virginia.



ADDITIONAL STORAGE AREA—An additional field will be opened for underground storage, and others enlarged. Columbia has stored 38 billion cubic feet of gas in several underground storage reservoirs. It draws on this supply to meet the winter demands and then refills the reservoirs during the summer.

NEW RESERVE SUPPLY—Nine propane-air gas plants will be erected at advantageous points. They will be installed as a further aid in supplying cold weather demands. Propane-air gas may be interchanged with natural gas and has been employed extensively in this country to supplement natural gas supplies.

THE COLUMBIA GAS SYSTEM

NATURAL GAS

East Texas Gas-Waste Committee to Meet

AUSTIN, Tex.—Oil producers and pipe-line personnel in East Texas field will attend the October meeting of the East Texas Gas-Waste Committee to be held at 10 a.m. October 15 in the office of the Texas Railroad Commission in Kilgore.

The seven-man committee representing the commission and major and independent pipe-line, producing, and natural-gasoline companies operating in the field is continuing its study of daily and monthly fluctuation in gas input to field plants. The irregularity of oil and attendant gas production showed an August increase over preceding months in spite of voluntary cooperation with the committee's program on the part of many producers. Continued burning of flambeaux and other evidences of gas waste have also been reported to committee members.

In line with the railroad commissioner's pledge to back the committee's recommendation and enforce gas conservation in the field, a member of the commission will attend the East Texas meeting to aid in explanation of the plan for equalizing casinghead-gas production, thereby reducing peak periods when input to gasoline plants exceeds their capacity. The committee proposed to conclude its study before the end of the year and cited the possibility for complete elimination of waste by adjusting plant operations to a sufficiently constant level to render residue gas suitable for pipe-line purchase.

I.N.G.A.A. to Meet in Fort Worth November 22

WASHINGTON.—The Independent Natural Gas Association of America will convene November 22 at the Blackstone Hotel in Fort Worth for its 1946 annual meeting which John A. Ferguson, executive director, said will be the most important held in the association's history.

"With the Federal Power Commission expected to report to Congress on the results of that agency's year-long investigation of the industry, it will be most important for representatives of the industry to be brought up to date and keep abreast of activities," Ferguson said. "We are expecting the largest attendance of any of our annual meetings."

Program for the meeting is being arranged by a committee headed by Joseph E. Bowes, president of Oklahoma Natural Gas Co. Besides papers on subjects of interest to the industry, several association directors will be elected to fill expiring terms, and the new board will select officers.

Hearings to Open Soon in Texas Gas Investigation

AUSTIN, Tex. — A five-member committee set up more than a year ago to prepare recommendations on the natural-gas industry for the Fifteenth Texas Legislature, is making plans to begin hearings in its investigation in the near future.

Most of the hearings will be held at Austin, though one or two may be scheduled elsewhere in the state, according to T. C. Chadwick, state senator of Quitman. The Senate committee recently met informally in Austin, preparatory to beginning hearings and announcing its plan of procedure.

The committee has broad authority to study all phases of the natural-gas branch of the petroleum industry, including regulation and taxation in the nation's largest gas-producing state.

Another Hearing Set on West Edmond Gas Waste

OKLAHOMA CITY.—Another attack on venting of natural gas in Oklahoma's West Edmond field is to be made October 14 by Oklahoma conservation officials in a hearing before the state Corporation Commission.

Several weeks ago the commission slashed the field's oil allowable from 77,000 bbl. to 40,000 bbl. daily in an effort to halt "dissipation of the reservoir energy" through venting of gas.

The October 14 hearing will deal with a general revision of the rules and regulations on the field's Hunton lime zone, and Walker T. Pound, chief conservation officer, is expected to ask revision of the gas-oil ratio. The present ratio, 7,203 cu. ft. to one barrel of oil, is regarded as penalizing low-ratio wells. Pound's application to the commission said considerable gas is still being wasted despite the production restrictions made effective September 1.

Gasoline-plant and pipe-line facilities are inadequate to handle the field's concurrent gas production. Testimony at the September hearing showed that under the previous 77,000-bbl. allowable, 319,047,000 cu. ft. of the 384,597,000 cu. ft. produced daily was being vented.

States Get Proposal for Uniform Pressure Base

OKLAHOMA CITY.—Suggestion of the Interstate Oil Compact Commission's research and coordinating committee that a uniform pressure base for gas measurement be adopted by all states in order to assure uniformity of reports has been submitted to all state regulatory bodies.

The committee suggested the uniform pressure base of 14.65 psi. or assumed atmospheric pressure of 14.4 plus 4 ounces, which is the base required by statute in Arkansas and Texas.

New FPC Rules Issued

WASHINGTON.—Printed copies of the Federal Power Commission's new revised general rules, including new rules of practice and procedure which are effective immediately, have been issued by the commission.

Patents Listed on Register

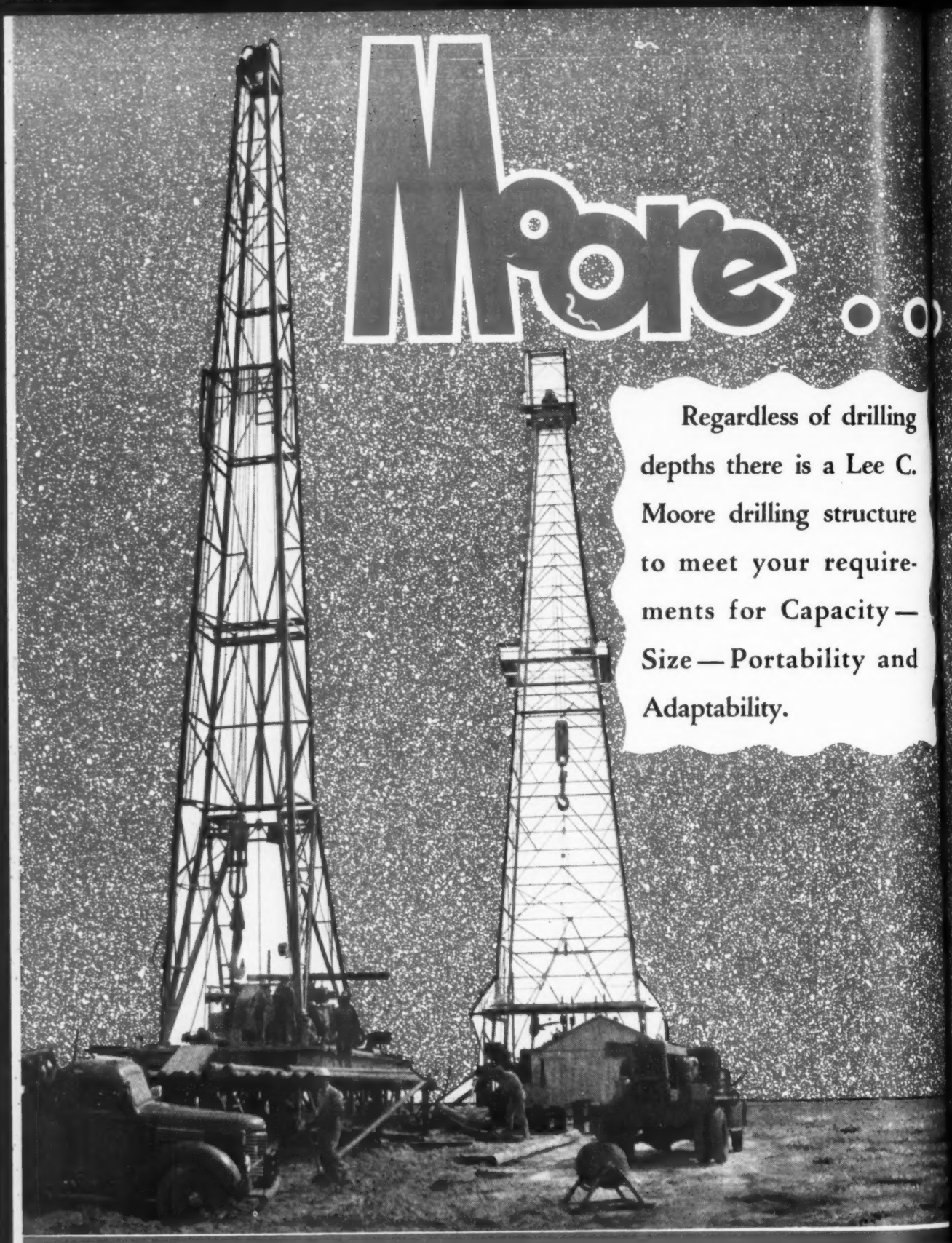
WASHINGTON.—Linde Air Products Co., New York, has placed 55 patents on the Register of Patents for licensing or sale, according to the Department of Commerce. The patents cover chiefly metal-welding processes and heat treatment of metals and include some related devices.

Natural Gasoline

Gas-Analysis Publication Distributed by N.G.A.A.

TULSA.—As result of several years' intensive cooperative work, the Natural Gasoline Association of America has issued recently its "Recommended Procedure for Analysis of Saturated Hydrocarbon Gases by Low-Temperature Fractional Distillation."

This research showed that the human element is a much greater source of error than are variations in equipment. The published method gives data on dimensions and arrangement of apparatus, details of procedure for carrying out the test and a compilation of preferred analytical practices. The work has been done under the control and direction of the association's technical committee. Copies may be obtained from William F. Lowe, association secretary, Kennedy Building, Tulsa.


Moore . . .
Regardless of drilling depths there is a Lee C. Moore drilling structure to meet your requirements for Capacity — Size — Portability and Adaptability.

MASTS and DERRICKS

MASTS— The Jackknife Cantilever drilling masts are designed and constructed to do the jobs of conventional drilling derricks. They are complete in every detail with Adjustable Skid Base, Crown Block, Catline Sheave, Deadline Anchorage, Ladders and Racking Platform. Standard auxiliary equipment such as Crown Safety Platform, and Sub-Bases are available for complete unitization of the masts. Nominal Heights are 87 ft., 95 ft., 98 ft., 127 ft., 129 ft., and 136 ft. Nominal Capacities are 300,000 lbs., 360,000 lbs., 450,000 lbs. and 720,000 lbs.

DERRICKS—"KAY" standard drilling derricks are available in all standard heights and sizes conforming with A.P.I. specifications. To meet the demands of extreme depths a line of "KAY" tall derricks, outside the range of A.P.I. standards, has been developed. These derricks are available to 182 ft. height, 38 ft. base and 5 ft. 6 in, or 6 ft. 9 in. water table opening. Capacities to 1,100,000 lbs.

Skid Type Sub-Structures, Welded Truss Type Sub-Structures, Welded Truss Type Pipe Racks, Walkways and Ramps, Truck Ramps and Adjustable Stairways are available for all drilling structures.

LEE C. MOORE & COMPANY, INC.

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STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 5, 1946

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	32	16	0	*16	43,979	1,207	1,115	0	0	0	0	0	0	0	0	0	0
Pennsylvania	78	40	7	†31	118,612	3,036	3,139	0	0	0	0	0	0	0	0	0	0
West Virginia	12	0	11	1	40,781	567	612	0	0	0	0	0	0	0	0	0	0
Ohio	28	10	8	10	73,466	942	721	1	0	0	3	4	3	0	12	31	46
Indiana	6	5	0	1	10,481	282	151	0	0	0	0	0	3	0	0	14	17
Kentucky	3	1	1	1	5,429	355	404	0	0	0	0	0	5	0	0	31	36
Illinois	51	30	0	21	132,671	1,740	1,370	3	0	0	5	8	39	0	1	335	375
Michigan	17	5	5	7	27,182	626	583	0	0	1	3	4	19	0	7	201	227
Kansas	44	24	12	8	141,436	1,516	1,320	0	0	0	4	4	23	0	1	199	223
Neb., Mo., Iowa	0	0	0	0	0	15	19	0	0	0	0	0	0	0	0	11	11
Oklahoma	70	43	5	22	229,471	2,109	1,857	2	0	2	12	16	66	0	31	262	359
Texas	135	85	11	39	635,859	6,047	5,508	3	0	1	23	27	166	23	27	994	1,210
North Central	39	22	0	†17	98,454	2,162	1,696	2	0	0	10	12	53	0	4	412	469
West	37	30	0	7	183,820	1,317	1,366	0	0	0	5	5	41	0	1	139	181
Panhandle	6	3	3	0	17,894	249	431	0	0	0	0	0	0	0	0	5	5
Eastern	8	3	1	4	50,079	547	256	0	0	0	2	2	15	0	2	74	91
Gulf Coast	38	24	6	8	253,040	1,329	1,260	1	0	1	5	7	39	21	11	194	265
Southwest	7	3	1	3	32,572	443	499	0	0	0	1	1	18	2	9	170	199
Louisiana	31	13	2	16	175,601	1,037	798	1	0	0	6	7	42	9	7	145	203
Northern	19	7	1	11	63,998	585	324	0	0	0	2	2	8	0	2	80	90
Southern	12	6	1	5	111,603	452	474	1	0	0	4	5	34	9	5	65	113
Arkansas	5	4	0	1	22,610	140	136	1	0	0	0	1	7	0	0	30	37
Mississippi	7	5	0	2	62,727	189	281	0	0	0	1	1	1	0	1	52	54
Southeastern States	1	0	0	1	6,030	34	46	0	0	0	1	1	1	0	0	28	29
Montana	5	4	0	1	9,943	237	239	0	0	0	0	0	10	0	1	24	35
Wyoming	1	1	0	1	11,392	132	162	0	0	0	0	0	11	0	3	30	44
Colorado-Utah	4	2	0	2	19,607	118	41	0	0	0	2	2	4	0	0	14	18
New Mexico	6	4	1	1	25,250	295	319	0	0	0	0	0	3	0	0	30	33
California	22	15	1	6	102,499	1,230	1,754	2	0	0	5	7	20	0	4	168	192
Total United States	559	307	64	188	1,895,026	21,854	20,575	13	0	4	65	82	423	32	95	2,599	3,149
Total previous week	623	316	88	219	1,975,122	21,295	20,023	9	1	2	77	89	410	32	91	2,534	3,067
Total Oct. 6, 1945	552	283	57	212	1,836,078			10	0	2	80	92	402	18	110	2,627	3,157

Service wells included: *16, †31, ‡2.

MARKET QUOTATIONS

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$1.17	....	....	....
19-19.9	1.21	....	$1.41	....
20-20.9	1.24	$1.20	1.43	1.07
21-21.9	1.28	1.22	1.45	1.09
22-22.9	1.32	1.24	1.47	1.11
23-23.9	1.35	1.26	1.49	1.13
24-24.9	1.39	1.28	1.51	1.15
25-25.9	1.43	1.30	1.53	1.17
26-26.9	1.46	1.32	1.55	1.19
27-27.9	1.50	1.34	1.57	1.21
28-28.9	1.54	1.36	1.59	1.23
29-29.9	1.57	1.38	1.61	1.25
30-30.9	1.61	1.40	1.63	1.27
31-31.9		1.42	1.65	1.29
32-32.9		1.44	1.67	1.31
33-33.9		1.46	1.69	1.33
34-34.9		1.48	1.71	1.35
35-35.9		1.50	1.73	1.37
36-36.9		1.52	1.75	1.39
37-37.9		1.54	1.77	1.41
38-38.9		1.56	1.79	1.43
39-39.9		1.58	1.81	1.45
40 and above		1.60	1.83	1.47

*Includes Lea County, New Mexico.

(Quotations shown here are f.o.b plant in tank cars and in cents per gal. as of last Monday. Crude prices reflect latest 25-cent advance except in California and Pennsylvania where no increase had been made as of Monday morning, July 29.)

REFINERY GASOLINE

Octane (A.S.T.M.)	78-78½† 73-75
Mid-Continent*	7.375-7.625 6.750-7.000
Tex. Gulf Coast	7.250 6.500-6.750
New York Harbor	8.750-9.500 7.750-8.500
California	7.000-7.875

*Basic Oklahoma Group 3. †1939 C.F. R. (research method).

NATURAL GASOLINE

Grades—	26-70	18-55
Oklahoma (Group 3)	4.750	5.700
N. Texas (f.o.b. plant)	4.250	5.100
N. Louisiana (f.o.b. plant)	4.500	5.400
California (averages)	5.500	6.250

CRUDE-OIL PRICES

Representative posted schedules per bbl.

East Texas	$1.60
Kettleman Hills, California*	1.69
Beauregard Parish	1.55
Illinois Basin	1.72
Pecos County, Texas	1.30
Bradford, Pennsylvania	3.41
Eastern Ill., and Western Ind.	1.57

Note: Exclusive of subsidy.
*For 37-37.9 gravity.

A.P.I. REFINERY REPORT

Week ended September 28, 1946
(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks—Gasoline	Stocks—Distillate	Stocks—Residual
East Coast	789	21,316	22,347	11,939
Appalachian	149	3.055	743	559
Ill., Ind., Ky.	769	15,393	8,681	5,286
Okla., Kan., Mo.	386	8,303	3,461	1,398
Inland Texas	221	2,653	608	736
Tex. Gulf Cst.	1,199	12,463	8,753	7,518
La Gulf Cst.	350	4,209	2,990	1,793
N. La., Ark.	58	1,466	475	232
Rocky Mtn.	139	1,458	639	823
California	769	15,008	11,130	27,373
Total 9-28-46	4,829	85,324	59,827	57,657
Total 9-21-46	4,785	85,854	57,906	56,914
Total 9-29-45	3,761	76,210	45,351	47,460

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended—	Bbl. of crude*
September 28, 1946	223,043,000
September 21, 1946	222,664,000
September 29, 1945	222,387,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	Oct. 5 crude oil	B. of M. Sept. demand	Sept. 28 crude oil
Alabama	1,000	1,200	1.000
Arkansas	78,650	78,000	78,200
California	869,700	855,000	875,600
Colorado	35,980	31,000	36,510
Eastern	69,350	65,000	68,000
Florida	15	200	100
Illinois	205,900	214,000	209,000
Indiana	19,050	19,000	18,300
Kansas	267,350	264,000	276,000
Kentucky	30,500	31,000	31,000
Louisiana	401,750	384,000	398,900
North Louisiana	96,850	.....	94,900
South Louisiana	304,900	.....	304,000
Michigan	46,475	47,000	47,270
Mississippi	74,055	61,000	73,200
Montana	24,240	24,000	24,620
Nebraska	700	800	700
New Mexico	99,250	100,000	99,400
Oklahoma	355,350	386,000	354,850
Texas	2,064,300	2,120,000	2,088,400
District 1 (Southwest)	19,425	.....	19,400
District 2 (Southwest)	146,400	.....	148,400
District 4 (Southwest)	216,700	.....	220,000
District 3 (Gulf Coast)	455,900	.....	464,850
District 5 (Eastern)	40,300	.....	41,000
District 6 (Eastern)	102,900	.....	103,500
East Texas field	320,300	.....	326,000
District 7C (West)	27,300	.....	27,200
District 8 (West)	487,500	.....	491,200
District 7B (W. Central)	33,225	.....	32,850
District 9 (N. Central)	129,400	.....	129,000
District 10 (Panhandle)	84,950	.....	85,000
Wyoming	107,760	108,000	109,630
Miscellaneous other	.....	800	.....
Total United States	*4,751,375	4,790,000	4,790,680
Change from prev. week	down 39,305		

Total production January 1-October 5 ..... †1,318,989,865 bbl.
Same period last year (crude, plus condensate) 1,326,134,625 bbl.

*Not incl. 22,670 bbl. condensate. †Incl. 6,732,690 bbl. condensate.

CRUDE-OIL STOCKS 223,043,000 bbl. as of September 28—up 379,000 bbl. One year ago 222,387,000 bbl.

GASOLINE STOCKS 85,324,000 bbl. as of September 28—down 530,000 bbl. One year ago 76,210,000 bbl.

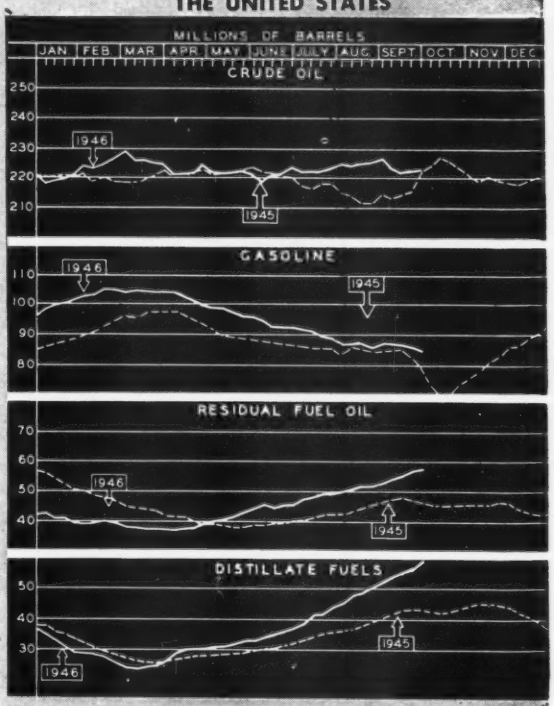
RESIDUAL FUEL-OIL STOCKS 57,657,000 bbl. as of September 28—up 743,000 bbl. One year ago 47,460,000 bbl.

GAS OIL AND DISTILLATE STOCKS 59,827,000 bbl. as of September 28—up 1,921,000 bbl. One year ago 45,351,000 bbl.

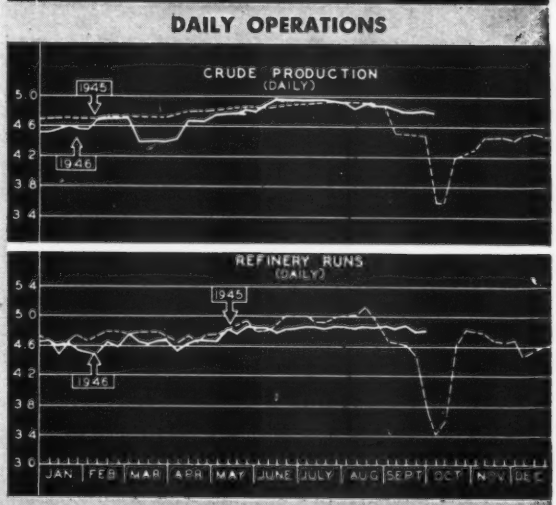
CRUDE-OIL PRODUCTION 4,751,375 bbl. as of October 5—down 39,305 bbl. One year ago 3,618,500 bbl.

REFINERY RUNS 4,829,000 bbl. daily week ended September 28—up 44,000 bbl. One year ago 3,761,000 bbl.

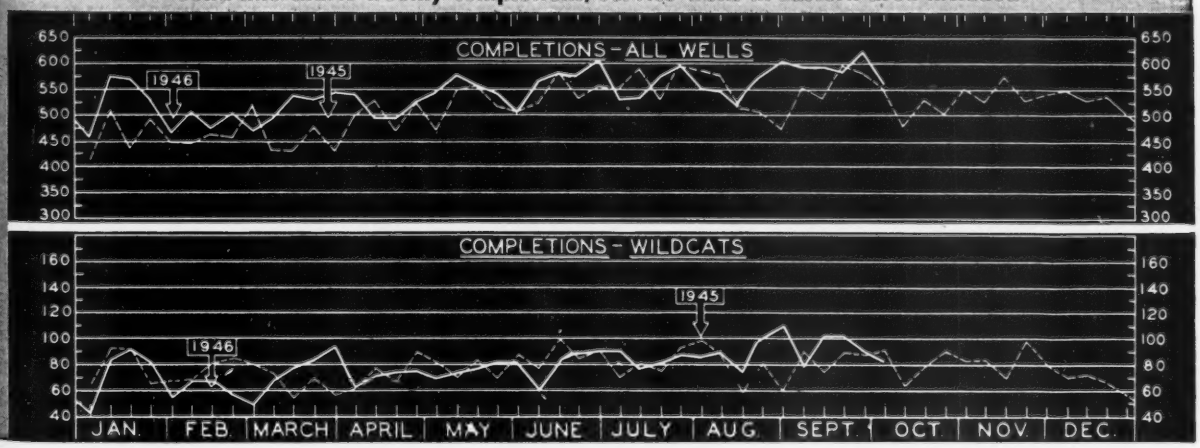
OIL STOCKS IN THE UNITED STATES



DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included



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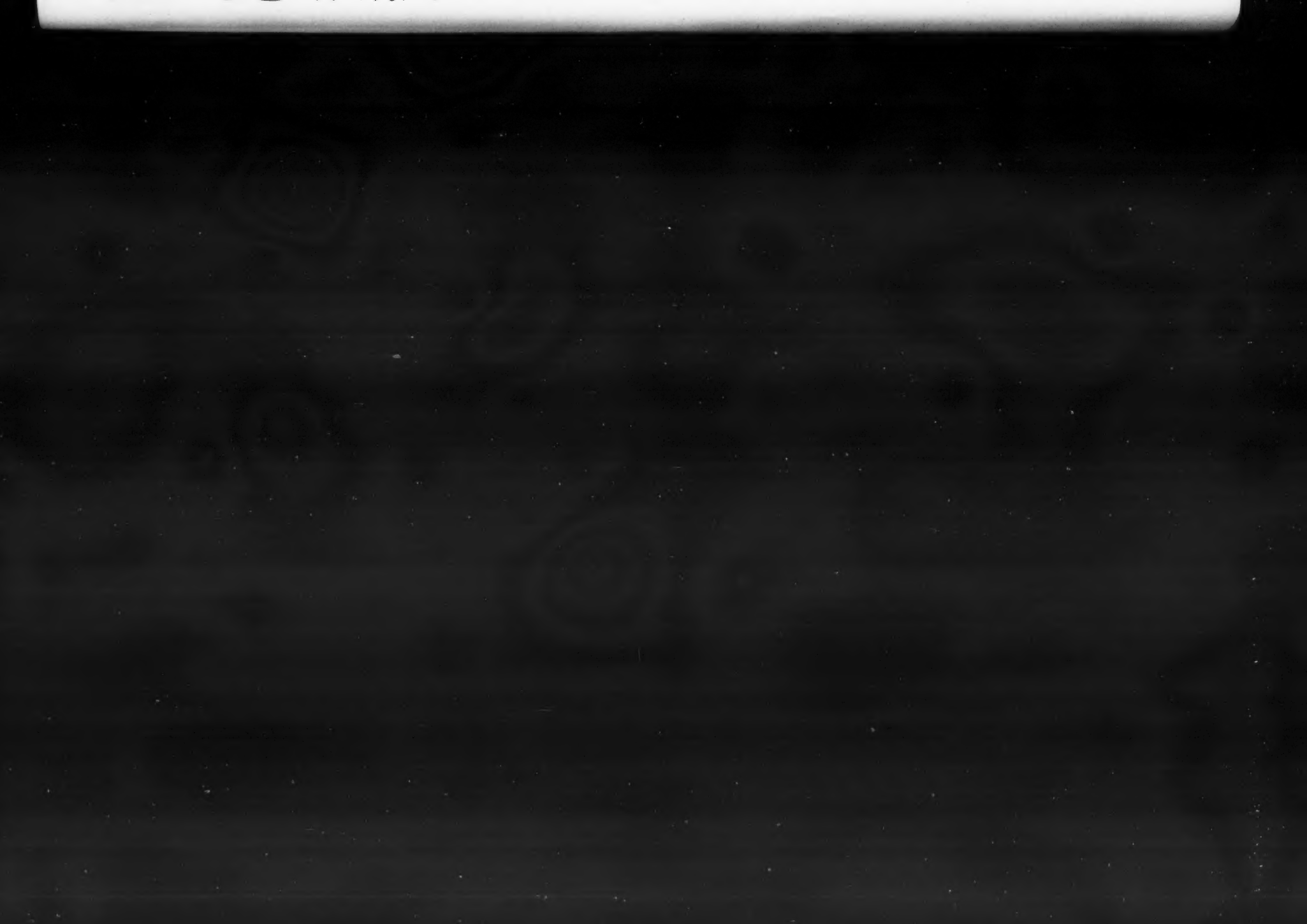

Exploration and Drilling

Geologists Face Problems

IT is easy to understand that a daily production of nearly 5 million barrels requires more manpower than the prewar 3½ million. It is also obvious that more geologists are required, as their work lays the foundation upon which our whole industry is built. Currently the geologists are carrying a double burden. They must find enough new oil from month to month to maintain the postwar high rate of production, and in addition, must build up the proven reserves back of that production. These reserves are the industry's raw-material inventory. As a result of wartime conditions, the present inventory ratio to current production is below normal.

When petroleum geologists face common problems, they attack them through the American Association of Petroleum Geologists. The association's current membership, approximately 5,000, reflects the increase in numbers of geologists, but it also raises questions brought on by size. One of the most urgent is how to give the younger members that sharpening of thinking and stimulation that comes from periodic get togethers with fellow scientists.

At present St. Louis, Chicago, and New Orleans are the nearest centrally located cities with facilities for taking care of a really well-attended annual meeting. The expense and travel time involved in sending large numbers of the younger geologists from their widespread districts to any of these cities is too great. As a result the annual meeting attendance tends to be confined more and more to the executive and administrative geologists. This will be doubly true in March 1947, when in accordance with custom, the annual meeting is to be held in Los Angeles.

Yet each year there is more for the younger geologists to learn. They must absorb the knowledge accumulated by their predecessors and master the practical application of it. Then they must pick up each new tool that comes along and work out the practical field problems involved in its usage. Interpretation of the constantly improved data supplied by the geophysicists and integrating them into the geological picture; working out the local techniques of electric logging, etc., are typical examples.

Problems involved in use of such auxiliary tools as radar, diving bells, airplanes, and helicopters are either here today or will be by next year. The executive and administrative geologists can solve the policy questions involved in their use, but the application techniques in the field will be worked out by the younger men. Their troubles can be summed up by saying they have a lot more to learn in a much shorter time than their predecessors.

In an effort to meet these problems of the younger men, the A.A.P.G. is experimenting with filling in a gap between regular meetings of local branches and the annual meeting, by holding two regional meetings. One will be held at Biloxi, Miss., this month, the other at Wichita in January. At Biloxi, the general theme will be the Gulf Coast and southeastern states. At Wichita, the areas between the Wichita-Arbuckle mountains of southern Oklahoma and the Canadian border will be stressed. At Wichita, in addition, 1 day will be devoted to unusual oil fields, where exceptional types of oil accumulation will be stressed. The objective is to emphasize the danger of stereotyped thinking about where oil fields may be found.

If the industry sends large numbers of the younger geologists to these meetings from the nearby areas, the association will achieve its primary goal, that of giving the younger members the experience and benefits that come from getting together with fellow scientists with new and fresh points of view. If this appears to be successful, the number of such meetings will probably be enlarged in future years. San Antonio, Corpus Christi, Shreveport, Jackson, Oklahoma City, and other towns even smaller, could handle regional programs.

MICHIGAN

Clare County Gas Field Gets Five Large Wells

SAGINAW.—Results of 17 oil and gas completions in Michigan in the past week were marked chiefly by continued development of Clare County's Lincoln Township gas field, where 4 more heavy-production Freckelton wells were completed by Michigan Consolidated Gas Co.

Five small oil producers also were completed and there were seven dry holes, three being wildcats. A fourth wildcat completion was a gas well in Zeeland Township, Ottawa County. A 100-bbl. oil well in Allegan's Monterey pool was the best of the 5 oil wells.

In contrast to usual exploration, all of the completions were comparatively shallow wells, the deepest of the lot being a dry hole at 2,785 ft., the shallowest a wildcat gas exploration failure at 980 ft.

Of the 14 new locations, 5 are for Osceola County, 4 for Allegan County, and 1 each for Bay, Isabella, Gladwin, St. Clair, Newaygo, Saginaw and Van Buren.

MICHIGAN SUCCESSFUL WILDCAT

Ottawa County, Zeeland Township: Clawson Development Co. 1 B. & A. Blauwkamp, C SE SE 2-5n-14w, gas well, 1,000,000 cu. ft., TD 980 ft.

MICHIGAN WILDCAT FAILURES

Allegan County, Fillmore Township: J. W. Lang Co. 1 Martin Woudwyk, NE SE SW 16-4n-15w, dry in Traverse, TD 1,495 ft.

Van Buren County, Geneva Township: Harris Oil Co.-Del Fortney 1 Leon L. Barney, NE SW SW 16-1s-16w, dry in Traverse, TD 1,043 ft.

Oil Producers, Inc., 1 Herman Pritz, SE SW NW 14-1s-16w, dry in Traverse, TD 1,095 ft.

SOUTHWEST TEXAS

Cosden-Wilcox Field Gets First Oil Production

CORPUS CHRISTI.—The first oil production at Cosden-Wilcox field, Bee County, has been opened by Mackhank Petroleum Co. 1 W. D. Walton et al, in John Pace Survey, Abstract 247, ⅝ mile southwest of the gas-condensate discovery well. Drilled to a total depth of 7,322 ft., this well was completed for initial gage of 150 bbl. of clean oil per day through a 9/64-in. choke. Tubing pressure was 1,300 lb., casing pressure 2,250 lb., and gas-oil ratio 1,600 to 1. Production is from the Wilcox zone through perforations at 7,044-56 ft. Oil sand was logged in three sections in the upper Wilcox zone, with completion in the middle of the three sands. On a drill-stem test of the first oil sand at 7,016-36 ft., the well flowed 8 bbl. pipe-line oil per hour on a 6-hour test, with 1,500 lb. working pressure. The second sand was at 7,044-56 ft., where completion was made. The third sand, on drill-stem test at 7,068-71 ft., open 2½ hours, flowed an estimated 6 bbl. of oil per hour, with 1,550 lb. working pressure.

The Poehler field in Goliad County, received two completions this week. Atlantic Refining Co. 1 Gus M. and Alfred Bluntzer was a dual-completion, flowing 840,000 cu.

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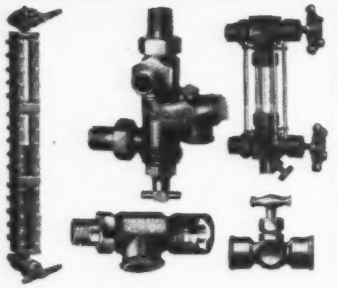

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ft. gas and 59 bbl. of condensate per day through perforations at 8,025-34 ft. and 56 bbl. oil per day from sand at 8,321-24 ft. through a ¼-in. choke. Gas-oil ratio was 25,010 to 1, tubing pressure 1,260 lb., gravity 29°. Total depth is 8,326 ft. Sun Oil Co. 1 M. F. Gohlke, in Jacob Fifer Survey, drilled to total depth 8,336 ft., produced 28 bbl. oil per day on gas lift, through ⅜-in. choke, through perforations at 8,294-8,300 ft.

There were 34 new locations this week, 7 being wildcats, 4 in Duval, 1 each in DeWitt, Starr and Webb counties. Duval County took the lead this week with 7 new locations reported. Kleberg County was next with four, all in Seeligson field. Goliad, Karnes and Starr counties each received three locations. The 29 completions included 4 wildcats, 1 a new gas pool opener in Refugio County, and 3 dry holes, 1 each in Milam, Nueces, and Willacy counties. Eighteen new oil wells were added to the district with total production of 2,057 bbl. daily. There were six dry holes and five gas wells.

SOUTHWEST TEXAS SUCCESSFUL WILDCAT

Refugio County: New gas pool—Barnsdall Oil Co. 1 Mrs. E. T. Morrow, Edw. Perry Sur., Abst. 48, 1 mi. S of McFadden area gas production, top pay 2,240 ft., perf. 46 holes 2,251-62 ft., TD 7,165 ft., PT—gas well, no gage, shut-in pressure 970 lb.

SOUTHWEST TEXAS WILDCAT FAILURES

Milam County: James C. Walker 1 D. R. Maddox, J. J. Acosta Sur., 3 mi. N of Thorndale, dry, TD 2,200 ft.

Nueces County: Brown & Wheeler 1 Lamar Folda, Enrique Villareal grant, 4 mi. SW of Corpus Christi, dry, TD 9,186 ft.

Willacy County: Jay Simmons 1 Gilbert Kerlin and American United Life Ins. Co., San Juan de Carricitos grant, 1½ mi. W of Willamar field, dry, TD 9,517 ft.

ROCKY MOUNTAIN

Elk Springs Structure May Produce From Weber Sand

DENVER.—A new oil field in western Colorado appears imminent in Continental Oil Co. 1 Margaret V. Smith, SW SE SW 30-5n-98w, on the Elk Springs structure, Moffat County, western Colorado. It topped the Weber sand, the producing horizon in the Rangely field, at 6,087 ft. and cored to 6,111 ft., the present total depth. The formation showed good saturation in the cores for the entire 24 ft. The top part of the section was hard and tight, but gradually loosened up, and the last 8 ft. came out a bleeding core. A drill-stem test at 6,087-6,111 ft., open 20 minutes, resulted in a recovery of 210 ft. of oil and gas-cut mud, but no water. The oil tested 29.5°-gravity, corrected, and is very similar to the Rangely crude. It was accompanied by a small, steady flow of gas. The hole is being conditioned to run the 7-in., which will be set on top of the sand, and then coring will be resumed. The section probably is around 600 ft. in thickness.

The Elk Springs structure is a northwest-southeast trending anticline on the northeastern rim of the Uintah Basin, in which the Rangely field is located. The discovery is approximately 28 miles northeast of Rangely, and will be the second oil field in the basin. The structure is similar in type to the one at Rangely, and the formations lie at approximately the same depth. There was a slight thinning of the red beds at Elk Springs, but the Park City formation was somewhat thicker, and the interval between the top of the red beds and the Weber is approximately the same, there being a difference of only 90 ft. as compared with the Rangely discovery well. Continental has approximately 2,165 acres on the structure, and Stanolind Oil & Gas Co. has around 350 acres. These holdings are exclusive of leases held just outside the structural boundary as at present mapped.

The discovery has more far-reaching significance than the bringing in of a new oil field. The development at Rangely attracted attention to the enormous Uintah basin which extends across the Colorado line far into Utah. More than 3,000,000 acres have been leased up by major companies and extensive geological and geophysical work has taken place the past year. There are numerous structures in the basin in Utah, and an intensive exploration campaign is expected to develop by spring. Carter Oil Co. is now drilling in the Vernal district 60 miles west of Elk Springs. In between the Carter well and Rangely is the Ashley Valley structure which produced gas for a number of years from the Morrison sand, but which never has been tested to the Weber. Stanolind controls the top acreage. Fifty miles to the northwest of Elk Springs, in Daggett County, is the Clay Basin gas field operated by the Mountain Fuel Supply Co. Location has been made for a Weber sand test and it is expected to spud before winter sets in. The Elk Springs discovery is more closely related to the Rangely operation than to the other developments in that general area. Mountain Fuel Supply Co.'s Church Buttes discovery, 100 miles to the northwest of Elk Springs, is in the Green River Basin. A number of Weber sand tests have been drilled in the Axial Basin, in which is located the Iles, Moffat, and other pools. Uintah Basin is separated from Axial Basin by the Cross Mountains which lie to the east of Elk Springs. Axial Basin tests to the Weber have so far been unsuccessful. Among the Weber sand wells drilled were tests at Iles, Beaver Creek, Maybelle, Skull Creek, Wilson Creek and Meeker. Union Oil Co. drilled Elk Springs in 1924 and had 9,000,000 cu. ft. of gas in the Dakota at 3,665 ft., but ran out of hole at 3,973 ft. and was abandoned. It was only ¼-mile from the Weber discovery.

Kutz Canyon discovery.—A show for a discovery is reported in Paul B. English and Byrd-Frost, Inc., 1 Government, C NW SW 4-27n-10w, in the Kutz Canyon gas field in San Juan County, northwest New Mexico. A core in the top of the Point Lookout sand, in the lower Mesa Verde formation of Upper Cretaceous age at 4,402-31 ft. resulted in a recovery of 29 ft. of oil saturated sand. The first 5 ft. were hard and tight, but the remainder of the section was porous and apparently well saturated. A drill-stem test with the tool open 20 minutes resulted in a recovery of 50 ft. of distillate testing 72°-gravity and a strong flow of gas. A shale break at 4,431-95 ft. showed nothing of value, but at the last named depth more gas was encountered. It was still in the Point Lookout at this depth. The hole was filled with heavy drilling mud in anticipation of striking gas, and no satisfactory test has yet been completed. Kutz Canyon has been producing gas from the Picture Cliff sand in the upper Mesa Verde at around 1,800 ft. since 1927. The wells make from 1,000,000 to 4,000,000 cu. ft. per day.

In 1928 Kutz Canyon Oil & Gas Co. started 1 Day, SW SW 20-28-10w, and in 1935 encountered the Point Lookout at approximately 4,390 ft. and had a good show of oil and gas, but the hole was lost through a bad fishing job and no test was made. This well was located 3 miles to the northwest of the present discovery. Same interests then started 1 Davidson, a mile to the southeast, and last year Transcal Petroleum Corp. took over the operation and drilled 190 ft. of the Point Lookout sand to 5,750 ft. when hole was lost with several strings of tools in it. The sand, however, was very hard and tight and failed to show commercial production. Early this year English-Byrd-Frost interests contracted for a Dakota sand test for half of the 12,000-acre block and spudded last July. It will test

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at present depth before deciding whether to go on to the Dakota.

New operations.—There were 13 new operations reported, of which 3 were in the Rangely field in Colorado; one each in Big Muddy, Half-Moon, Poison Spider, and Steamboat Butte, in Wyoming; and 4 in Cut Bank and 1 in Bowdoin, in Montana. All were development wells.

Completions.—Eleven wells were completed, of which 7 were oil wells with initial production of 1,620 bbl., and 4 were dry holes. These were distributed as follows: Colorado 4, of which 2 were oil wells in the Rangely field for 743 bbl., and 2 were wildcat failures. Wyoming had 1 oil well in South Elk Basin for 720 bbl., and 1 dry hole in Big Muddy. Montana had 5 completions, of which 2 were oil wells in Cut Bank and 2 oil wells in Kevin-Sunburst for 157 bbl., and 1 dry hole in the Bowdoin field.

COLORADO WILDCAT FAILURES

Lake Creek, Jackson County: William L. Farrelly 2 Government, NW NW NW 3-11n-81w, TD 1,279 dry, dry in Sundance.

Beaver Creek, Routt County: Union Oil Co. 1 Crawford, NE NE SW 32-4n-89w, TD 5,801 ft., dry, top Frontier, 2,810; Dakota, 3,289; Lakota, 3,381; Morrison, 3,420; Curtis, 3,869; Entrada, 3,950; Shinarump, 4,479; Weber, 5,249; Morgan, 5,368.

TEXAS GULF COAST

New Oil Pool Discovered In Orange County

HOUSTON.—A new oil pool has been opened in the area 1½ miles northwest of the Port Neches field, Orange County, by Hinkle Drilling Co. 1 G. M. Adcock, in Jno. Stephenson Survey. Drilled to a total depth of 8,954 ft., this well gaged 300 bbl. of 37°-gravity oil through a 10/64-in. choke, with gas-oil ratio of 731 to 1, and 1,400 lb. flowing pressure on tubing. Production is through 24 perforations in the lower Frio sand at 8,774-78 ft. Five other shows were encountered in the 200 ft. of Frio sand drilled.

Magnolia Petroleum Co. 2 Live Oak, second test for the Tidehaven discovery area of Matagorda County, 1,512 ft. north of the discovery oiler, in J. W. E. Wallace League, topped the discovery sands 35 ft. high to the discovery, but had no shows of oil or gas. Operators continue to drill below 9,560 ft. in hard formation. Contract depth is 10,000 ft.

A new sand for the Lakeview (Hutchins) pool has been opened by W. A. Clark, Jr. 1 Anna Tobola Estate, in I&GN Survey. Drilled to a total depth of 5,014 ft., this well was completed as a dry gasser, no gage, through perforations at 4,796-4,806 ft.

There were 26 new locations reported this week with 9 being wildcats, 2 in Wharton, and 1 each in Austin, Brazoria, Chambers, Fort Bend, Jefferson, Liberty, and San Jacinto counties. Four wildcats, 1 oil and 3 dry holes, were included in the 16 completions. The discovery was in Orange County while the dry tests are in Fort Bend, Harris, and Montgomery counties. Liberty County received three completions, Harris two and Wharton two.

UPPER GULF COAST SUCCESSFUL WILDCAT

Orange County: New oil pool—Hinkle Drilling Co. 1 G. M. Adcock, Jno. Stephenson Sur., 8,100 ft. northwest of Port Neches field, TD 8,954 ft., per. 24 holes 8,774-78 ft. Lower Frio, PT 300 bbl. per day through a 10/64-in. choke, gas-oil ratio 732 to 1, TP 1,390 lb., gravity 37°, 0.1 per cent water.

UPPER GULF COAST WILDCAT FAILURES

Fort Bend County: Roxoil Drlg. Inc. and Sam Dunnam 1 H. I. Schroder, H&TC Sur., 1½ mi. E of Needville, dry, TD 7,808 ft.

Harris County: Stanolind 1 L. H. Caesar, East Fairbanks area, Samuel Lewis Sur., dry, TD 8,265 ft.

Montgomery County: Kirby Pet. Co. 1 George Sealy Estate, J. C. Pitts Sur., 4 mi. SE of Willis, dry, TD 5,010 ft.

CANADIAN FIELDS

Turner Valley Well Flows 568 Bbl. Daily

CHATHAM.—In the North Central Turner Valley area, Royalite-Lowery 6, LSD 16, 10-20-3w5, has initial production of 568 bbl. from the Madison lime at 8,478-8,714 ft.

Home Oil 22, LSD 16, 32-20-3w5, with Madison at 8,434-8,956 ft., is acidizing and testing with production between 150 and 200 bbl. Home 23, LSD 7, 5-21-3w5, on the west flank of the north extension area, got the Madison at 8,350 ft. and is getting into the lower porous below 8,677 ft. after drilling 115 ft. in the upper zone. Three other Turner Valley tests are drilling.

Stolberg.—In the Central foothills, Imperial-Shell-Stolberg 1, LSD 3, 22-41-14w5, finished at the record depth for Canada of 13,747 ft. with Madison occurrences at 12,218 and 12,827 ft., has completed testing in the lime without commercial results. The Blairmore sand formation above the lime is being perforated and tested.

Jumping Pound.—On the Jumping Pound structure west of Calgary, Shell 16-14-J, LSD 16, 14-25-5w5, which got the Madison at 10,335 ft., made a drill-stem test of 7

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ft. of porosity at 10,485 ft., getting a small gas flow with some condensate. Swabbing to 6,100 ft. depth showed a trace of salt water in the fluid. Tests are continuing. Location is immediately southwest of Shell 4-25-J discovery well, finished in the lime at 9,947 ft. with a good gas flow and a fair condensate recovery.

Elk Point.—In the northern Alberta plains area, Elk Point 2, LSD 3, 14-57-6w4, finished at 4,359 ft. after proving extensive salt beds and developing 500,000 cu. ft. gas, is being abandoned following loss of a tester in the hole. Elk Point 3 has located in LSD 15, 35-57-5w4, in an attempt to further extend the potential gas area. Tests are jointly sponsored by Anglo-Canadian Oil, Home Oil and Calgary & Edmonton Corp.

Steveville.—In the Steveville-Princess field, eastern Alberta, Princess-Brooks-CPR 1, LSD 13, 17-19-13w4, finished at 3,415 ft., has plugged off the nonproductive Madison lime and is testing the Sunburst sand, with a gas flow around 2,000,000 cu. ft. and a small oil production indicated. Princess-Brooks-CPR 2 has location about 1½ miles due east in LSD 3, 21-19-13w4. South Princess Joint Venture CPR 2, LSD 4, 4-19-11w4, bottoming at 4,205 ft., is giving further acid treatments in the lime where initial tests showed 16 bbl. of fluid, including some mud and water.

Ram River.—In the Ram River area, in the central Alberta foothills, Ram River Oils 2, LSD 3, 2-37-11w5, bottoming at 5,745 ft., has been reconditioned and is installing pump to take light crude production from the Devonian limestone. Ram River 4, LSD 9, 36-34-10w5, bottoming at 1,453 ft., showed promising core with oil seeping into the hole and is waiting for acid.

SOUTH LOUISIANA

Bon Air Field Receives Southward Extension

NEW ORLEANS.—Sohio Petroleum Co. 2-A Claudius Fontenot, ¼ mile south extension on the east side of Bon Air field production, Jefferson Davis Parish, gaged 162 bbl. of 37°-gravity oil daily through a ⅛-in. choke with 1,225 lb. flowing pressure. Production is through perforations at 9,686-94 ft. Total depth is 9,751 ft. Saturation was topped at 9,678 ft.

Union Sulphur Co., Inc. 1 Eugene Ellender et al, discovery well of Choupique field, Calcasieu Parish, 17-11s-10w, on potential gage flowed 93 bbl. of oil per day through a 14/64-in. choke, tubing pressure 3,100 lb., casing pressure 300 lb., gravity 40°, no water, gas-oil ratio 12,781 to 1. Total depth is 10,037 ft., with production through perforations at 8,825-31 ft.

Shell Oil Co., Inc. 18-A Jeanerette Lumber & Shingle Co., twin test to the 18 Jeanerette blowout on the northeast edge of production at West Lake Verret, 11-14s-12e, in St. Martin Parish, has been completed as a good oiler. It flowed a potential gage of 210 bbl. of 37°-gravity oil in 24 hours through an 8/64-in. choke, with 1,025 lb. flowing pressure on the tubing. Gas-oil ratio was 526 to 1. Production is through perforations at 7,665-80 ft. Total depth 7,727 ft.

Shell will drill a wildcat test in the same area, approximately ½ mile north of east side production of West Lake Verret. It is the 1 I. Popkin in 11-14s-12e, which is scheduled to 11,500 ft.

There were 14 new locations reported this week, 2 being wildcats, 1 each in Beauregard and Cameron parishes. There were five wildcat completions, one an oil pool opener in Calcasieu Parish, and four dry holes, two in St. Mary, and one each in Jefferson Davis and Terrebonne par-

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ishes. St. Mary Parish received the greatest activity with three completions.

SOUTH LOUISIANA SUCCESSFUL WILDCAT

Calcasieu Parish: New oil pool, Choupique—Union Sulphur Co., Inc. 1 Eugene Ellender et al, 17-11s-10w, 5 mi. N of West Hackberry field, TD 10,037 ft., perf. 24 holes 8,825-31 ft., PT 93 bbl. oil per day through a 14/64-in. choke, TP 3,100 lb., CP 300 lb., gravity 40°, no water, gas-oil ratio 12,781 to 1.

SOUTH LOUISIANA WILDCAT FAILURES

Jefferson Davis Parish: Stanolind 1 W. E. Walker, Welsh field area, 29-9s-5w, dry, TD 8,701 ft.

Terrebonne Parish: Superior Oil Co. 1 Louisiana Land & Expl. Co., Four Isle Dome, 24-21s-16e, dry, TD 6,011 ft.

St. Mary Parish: Amerada Pet. Corp. 1 Lagermann-Lacy, Baldwin area, 47-14s-9e, 3 mi. S of Charenton field, dry, TD 7,558 ft.

Atlantic Refg. Co. 1 Grand Lake State, in Grand Lake, 19-13s-10e, 2 mi. N of Charenton field, dry, TD 12,102 ft.

CALIFORNIA

Inglewood-Potrero Looks Promising

LOS ANGELES.—Several deep exploratory wells in the San Joaquin Valley district, and stepout locations from recent discoveries in the Los Angeles Basin hold major interest of California operators.

A possible new discovery nearly a mile northwest of nearest production in the Inglewood-Potrero area, Los Angeles County, was delayed in testing last week because of natural-gas shortage but the well has shown evidence of production. The well is Basin Oil Co. 1 Standard Brick, Section 28-2s-14w. Operators were forced to convert equipment to use fuel oil when natural-gas supplies were cut off owing to cooler weather which increased domestic-fuel requirements.

The Inglewood-Potrero prospect is bottomed at 10,082 ft. in shale with streaks of oil sand. Seven-inch casing was cemented at 9,935 ft. for protection of various zones of oil sand logged in Miocene from 9,300 to 9,900 ft. When testing for water shut-off behind the 7-in. and with 2 ft. of hole below the shoe, a showing of oil and a strong blow of gas resulted.

Shell Oil Co., Inc. completed 1-1 Winters unit, Section 19-8n-1e, Yolo County, for a mile extension of a newly discovered gas pool. Shell's new well produced 3,060,000 cu. ft. through 16/64-in. choke, with 4¾-in. casing gun perforated at 4,960-75 ft. and at 5,030-34 ft. The new producer is a mile northwest of 1 McCune, the discovery well.

New locations totaled 37 compared with 42 for the previous week, and are widely scattered. Five are in the Cymric field in Kern County; three each in Huntington Beach and West Newport Beach.

The deepest drilling well in the state, Pacific Western Oil Corp. et al 1 National Royalties, Section 5-26s-22e, Kern County, 10 miles east of the Lost Hills pool and in the so-called Miramonte area, is drilling at 15,141 ft.

In the South Belridge field, Belridge Oil Co. 62-W-33, in Section 33-28s-21e, is drilling and spot coring at 13,877 ft. Indicative of the continuing interest in South Belridge is Richfield Oil Corp.'s core-drilling program at the north end of this Kern County field. One of three coreholes was completed last week and two were drilling in the area centering around Sections 30 and 31-28s-21e. Meanwhile, Richfield 1 Berry, a projected deep test in Section 30-28s-21e, remained idle at 4,485 ft. where drilling was suspended for assembly of additional geological information.

In the Buena Vista Lake district, Kern County, Seaboard Oil Co. 73-14 SWUM-BVA, Section 14-32s-25e, was temporarily delayed at 12,227 ft. because of stuck drill pipe. In the same general vicinity, Continental Oil Co. 1 BVA, Section 8-32s-25e, is drilling at 9,542 ft.

Standard Oil Co. of California continues drilling at 11,414 ft. at its deep wildcat on the Middle Dome at Kettleman Hills, Section 30-23s-19e, Kings County.

The Texas Co. continued its program of gun perforating and squeeze cementing for a thorough test of 3 Holmes-Eureka in the Eureka area, Humboldt County. Through perforations at 5,660 to 5,710 and from 4,600-55 ft. the wildcat tested wet. Operators were squeezing off the most recent perforations for subsequent testing. The well was carried to 7,850 ft.

Two stepout locations are active in the recently discovered Gardena area, Los Angeles County. Another well has been started in the El Segundo area, Los Angeles County, where six major companies joined in drilling a recent discovery. It is Standard of California 2 Six Companies fee, Section 2-3s-15w, now drilling out below surface pipe cemented at 1,095 ft.

CALIFORNIA SUCCESSFUL WILDCATS

Orange County, Huntington Beach area: Signal Petroleum Co. of California, Ltd 2 Callens, 18-6s-10w, flowing 750 bbl., 18/64-in. choke, gun perf. 3,375-3,706 ft., TD 3,730 ft.

Kern County, Arvin area: Tide Water Associated Oil Co. 43-9 Tupman, 9-31s-29e, flowing 262 bbl., 30.9°, 1-in. choke, 380,000 cu. ft. gas; 7-in. 6,636 ft., TD 6,704 ft.

CALIFORNIA UNSUCCESSFUL WILDCATS

Kern County, Round Mountain area: Pacific Gulf Oil Co. 1 Karpe, 80-28s-29e, dry, TD 2,643 ft.

San Emigdio area: Western Gulf Oil Co.

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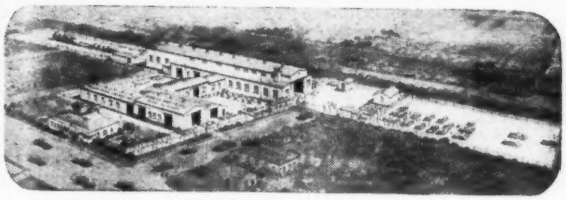

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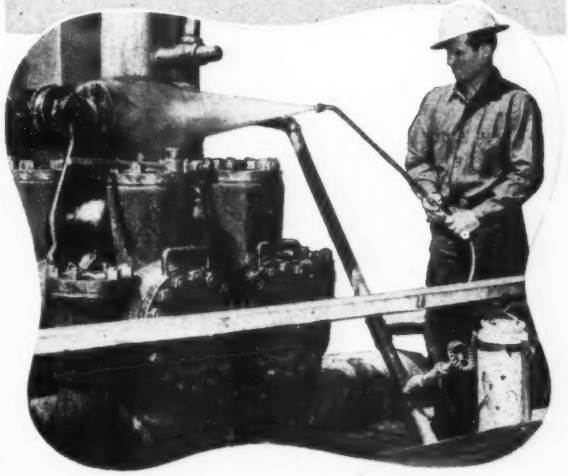

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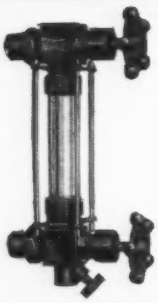

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3 San Emigdio, 31-11n-22w, form. test 3,264-3,362 ft. recov. 300 ft. mud, trace oil; dry, TD 4,019 ft.

McKittrick area: W. T. Woodward and American Placers 1 Flickinger, 36-30s-22e, gun perf. 4,810-30 ft., swabbed water, dry, TD 6,897 ft.

South Belridge area: Richfield Oil Corp. 1 Berry CH, 31-28s-21e, dry, TD 807 ft.

Fresno County, Jacalitos area: Shell Oil Co., Inc. 23-8 Kreyenhagen, 8-22s-16e, top Temblor 6,020 ft., top Kreyenhagen 6,980 ft., dry, TD 7,051 ft.

APPALACHIAN FIELD

Chestnut Ridge Gas Well Turned Into Lines

PITTSBURGH.—On Chestnut Ridge in Georges Township, Fayette County, southwest Pennsylvania, the wildcat of New Penn Development Co., Wm. E. Snee et al, on J. R. Smith farm, which had been flowing open, has finally been turned in the lines with a safe back pressure held on the well. With only the surface string in the hole (877 ft. 9⅝-in. casing) and no assurance that it had not been worn thin due to cable action, the tremendous volume of upwards of 40,000,000 cu. ft. gas a day presented a very great hazard especially as it was known that it would rock up to over 3,000 lb. per sq. in. A special crew was rushed in and, using ¼-in. pipe between the wall hole and the outside of the casing, pumped cement to set the surface string firm. About 700 sacks were used. Control gates were set and anchored to the cellar floor and the hole swedged down to 6-in., thence to a tee.

An emergency gas line of double 3-in. was laid to the well and one end of the tee connected to the line which gaged 9,250,000 cu. ft. gas with a back pressure of 400 lb. on the well. It was increased to 670 lb. back pressure and closed in with 18,000,000 cu. ft. gas feeding in the line. The top of the Onondaga chert is 7,062 ft. from a surface elevation of 2,500 ft. and the gas was struck at 7,063 ft., with an initial gage while reaming of 400,000 cu. ft. which increased during a fishing job to an estimated 60,000,000 to 75,000,000 cu. ft. and a final open flow by gage of 24,000,000 cu. ft. when shut in. During the emergency work, with reaming tools in the hole plus the fishing tools which had a hold on a piece of line, the entire cable was lowered into the hole so that work could be done. It is problematical what the gage might have been if the hole had been clear.

In North Strabane Township, Washington County, Charles E. Young completed drilling the test on the Rosa Topka farm just north of the good Gordon oil well on the John Gregor farm, and the test immediately began flowing 20 bbl. an hour from the Gordon sand. This widens out the new pool to the north and since the Keystone Gas Co. deepened the Gantz sand wells on the Markle farm to the south to the Gordon sand, it is now the best producing pool in southwest Pennsylvania.

More definite information points to a new major gas field in the northeastern part of West Virginia where Wm. E. Snee, Orville Eberly et al are completing a wildcat on the Harrison Sisler farm on Briery anticline in Portland district, Preston County. This test had been bottomed at 5,622 ft. in the Onondaga chert where there was an initial gage of 400,000 cu. ft. gas. While running the 7-in. casing, unexpectedly the packer set at 3,616 ft. and lodged the pipe. As there was a danger of losing the hole, an attempt was made to locate a smaller string of casing to run through the 7-in. to bottom, but none was available. Meanwhile the volume kept increasing, gradually, until it gaged 700,000 cu. ft. The tools were then run in the hole and after cleaning out to bottom, the well was drilled ahead 6 in. when the volume increased to 4,350,000 cu. ft. It was shut in on the 7-in. and immediately rocked up to 2,005 lb. which is increasing. Here the surface elevation is 2,036 ft., Onongada chert 5,575 ft., gas 5,622 ft. This is the third well on the closure, and is the second major discovery by Wm. E. Snee, of deep production from the lower Devonian, the initial being the field on Chestnut Ridge in Fayette County, Pennsylvania.

PERMIAN BASIN

Andector Pool Discovery Flows 1,176 Bbl. Oil

MIDLAND.—Humble Oil & Refining Co. 1-B Cowden, Section 11, Block 45, T-2-N, T&P Survey, opener of the Andector field almost on the Ector-Andrews County line, but in northwestern Ector, has been completed. On official test it flowed 1,176 bbl. of 44.2° gravity oil. Gas-oil ratio was 110 to 1. Production was through a ⅜-in. tubing choke and perforations from 8,545-85 ft. Total depth is 8,600 ft. The section had been treated with 500 gal. of acid. The discovery is 1¾ miles northeast of the Devonian discovery in the North Goldsmith field and 2¾ miles southwest of the Embar field in southern Andrews County. Humble 1-C Cowden, Section 3, Block 45, T-2-N, T&P Survey, 1¼ miles west and slightly south of 1-B Cowden, was drilling below 8,639 ft. in Simpson lime and shale. It is low structurally. Phillips Petroleum Co. 1-C Cowden, Section 3, Block 45, T-1-N, T&P Survey, discovery in the Silurian in the North Goldsmith field, ⅜ mile southeast

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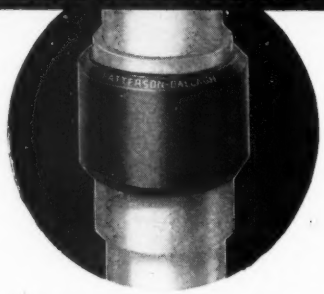

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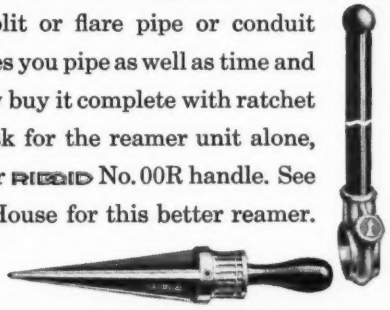

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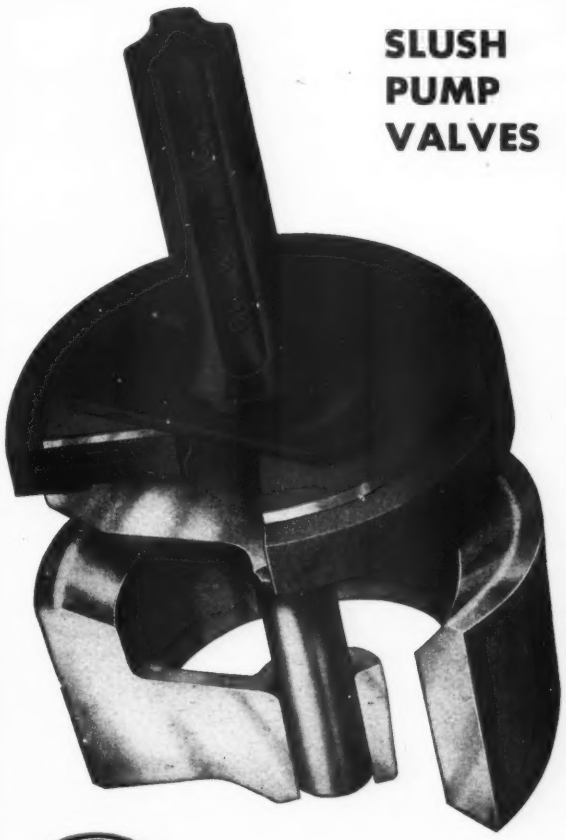

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of the Devonian discovery, awaited orders after flowing 239 bbl. of oil through a ½-in. tubing choke in 12 hours. The oil was cut 6 per cent sediment, making the net oil flow at a daily rate of 440 bbl. Flow was through perforations from 8,255-80 ft. after injection of 500 gal. of acid.

Roy Goldston 1 W. L. Moody estate, Section 32, Block 34, H&TC Survey, Ward County discovery 8 miles northwest of Grandfalls, has been completed to flow 30.38 bbl. of 31° gravity oil daily. Gas-oil ratio was 320 to 1. Production is in the Yates sand and Seven Rivers dolomite sections from 2,487-2,550 ft.

Humble 1 Elkins, Section 36, Block 5, H&GN Survey, ½ mile northeast of the Polar Ellenburger discovery in southwestern Kent County, cored from 7,795-7,804 ft. and recovered 7 ft. of lime with a show of oil. This was the first oil show for the test. Operator was coring ahead.

Argo Oil Corp. 1 Mrs. Dora Roberts, Section 294, Block 13, H&GN Survey, southeastern Reeves County wildcat 13 miles northeast of Balmorhea, was checking, preparatory to running 5½-in. casing for testing after drilling halted at 14,076 ft. The wildcat filled with oil in 13¾ hours and made a brief flow on a drill-stem test from 10,697-10,729 ft. in lime, reported to be the Wolfcamp.

Sharon Ridge, Scurry County, had six completions, Welch field, Dawson County, had three and TXL-Ellenburger and Goldsmith fields, Ector County, each had two. Fullerton field, Andrews County, had six locations, TXL field four and Keystone-Holt field, Winkler County, two. TXL field has 37 drilling wells; Fullerton field 33; Block 12 field, Andrews County, 19; Keystone-Ellenburger field, Winkler County, 18; Wheeler-Ellenburger field, Winkler and Ector counties, nine; Monahans North field, Winkler County, eight, and Andector field, Andrews County, six.

WEST TEXAS WILDCAT FAILURES

Coke County: Warren Pet. Corp. 1 Hamilton Est., Sec. 275, Blk. 1-A, H&TC Sur., 1 mi. S and 1 mi. W Blackwell, Ellenburger 6,367 ft., dry, TD 6,375 ft.

Dawson County: Ray A. Albaugh 1 W. C. Orson, Sec. 15, Blk. 33, T-5-N, T&P Sur., 6 mi. NE Spraberry field, elev. 2,668 ft., San Andres 3,390 ft., dry, TD 4,010 ft.

Hockley County: Brown & Wheeler 1 R. O. Hammill, Lge. 719, Lab. 25, State Capitol lands, 7 mi. NW Levelland, elev. 3,601 ft., San Andres 3,760 ft., dry, TD 4,802 ft.

Loving County: Argo Oil Corp. 1-C TXL, Sec. 7, Blk. 55, T-1, 1 mi. N Mason pool, elev. 3,071 ft., Delaware sand 3,868 ft., dry, TD 4,274 ft.

Lubbock County: Bankline Oil Co. 1 G. B. Adkisson, Sec. 37, Blk. C-2, ELRR Sur., 3 mi. SE Abernathy, elev. 3,333 ft., Tubb 5,760 ft., dry, TD 6,197 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Culbertson & Irwin, Inc., 1 Lynch, 21-19s-32e, an outpost to the East Lusk field in northwestern Lea County, having proved barren between 2,955-3,817 ft. in lime, plugged back to 2,955 ft. to test light shows of oil and gas. Ohio Oil Co. 1 Trimble, 11-17s-32e, in the West Roberts area of Lea County, was shot with 200 qt. of nitroglycerin from 3,945-4,104 ft. It then flowed oil at the rate of 171 bbl. daily. It is in the process of completion. Amerada Petroleum Corp. 1-A Hare, 33-21s-38e, an old well in the Drinkard area being drilled deeper, took a 210-minute drill-stem test from 6,495-6,518 ft. There was gas to the surface in 3 minutes, mud in 10 minutes and oil in 18 minutes. It flowed 19.3 bbl. of 42.3° gravity oil in 3 hours. Gas-oil ratio was 729 to 1. Old total depth was 3,754 ft. It is now drilling below 6,599 ft. in lime.

Paddock field, Lea County, had two completions and Grayburg-Jackson field, Eddy County, and Langlie-Mattix field, Lea County, each had one. Drinkard field, Lea County, had four locations, and Loco Hills, Eddy County, had two. Drinkard field had 17 drilling wells; Grayburg-Jackson field 11; Paddock field 7; Square Lakes field, Eddy County, 6; Brunson field, Lea County, 6, and Langlie-Mattix field, 4.

EASTERN TEXAS

Leon County Test Has Slight Show

DALLAS.—Daniels Oil Co. 1 Cox, John Scritchfield Survey, wildcat 4 miles southeast of Flynn, Leon County, cored from 7,016-7,126 ft. and recovered black shale. There was a very slight show of oil in the pits while coring to 7,085 ft.

Humble Oil & Refining Co. 1 Moseley, D. Martin Survey, prospective second producer for the Mount Sylvan area, Smith County, was swabbing through perforations from 7,360-80 ft. in an attempt to get a sustained flow. The well made 54 bbl. in 9 hours on one flow. Humble 1 Ada Lee et al, Felix Flores Survey, has further defined the limits of the Sand Flat field of Smith County, being dry at 7,527 ft. in the Paluxy.

Magnolia Petroleum Co. 1-A Southern Pine, Leonard Williams Survey, 2 miles southeast of Weches in Houston County, is dry at 7,400 ft., having failed to find anything in the Edwards. Atlas Oil & Refining Co. will drill a 5,500-ft. wildcat in western Cass County. It is 1 Laura Thomas, 1,120 ft. from the north line and 600 ft. from the east line of W. G. Anderson Survey, Abstract 31. The wildcat will be 7 miles southeast of Naples.

Hawkins field, Wood County, had two completions this week and Talco field,

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Titus County, and Carthage field, Panola County, each had one. Manziel field, Wood County, had two locations, William Wise field, Cherokee County, Pickton field, Hopkins County, and Chapel Hill field, Smith County, each had one. Carthage field has 32 drilling wells; Hawkins field 7; Sand Flat field, Smith County, and Opelika field, Henderson County, each 5, and Tri-Cities field, Henderson County, Henderson field, Rusk County, and Waskom field, Harrison County, each 4.

EASTERN TEXAS WILDCAT FAILURES

Van Zandt County: Delta Drlg. et al 1 B. J. Houston, A. L. Martin Sur., 1 mi. E and slightly N Martin's Mill, elev. 477 ft., Pettit 8,907 ft., Travis Peak 9,027 ft., dry, TD 9,210 ft.

Wood County: Delta Drlg. 1 W. D. McKenzie, Joel P. Wood Sur., 2 mi. NE Alba, elev. 467 ft., Duck Creek lime 6,475 ft., dry, TD 6,520 ft.

N. CENTRAL TEXAS

Masters Pool Deep Test Gets Caddo Production

WICHITA FALLS.—Fred M. Manning, Inc., 1 Graham-Magnolia, Section 985, TE&L Survey, deep test in the old Masters pool of southeastern Throckmorton County, 2½ miles north of Woodson, has been completed to flow 542 bbl. of 42.4° gravity oil in 24 hours through 18/64-in. choke. Production is from the Caddo from 3,834-3,850 ft. Casing pressure was 1,000 lb. and flowing pressure was 700 lb.

Jack Grace 1-A Edwards, T. M. Hughes Survey, wildcat 11 miles northeast of Henrietta, Clay County, is dry at 6,009 ft. with no shows. Grace 1-B Bryant Edwards, S. C. Beldon Survey, wildcat 6 miles east and slightly south of Henrietta, drilled oil sand from 6,479-94 ft. There was a strong blow of gas on a drill-stem test and 90 ft. of oil and gas-cut mud was recovered. Operator was running pipe. The test was probably in the Pennsylvanian sand. Bell Oil & Gas Co. will drill 1 Ruth Dowling, a wildcat 4 miles north and a little west of Byers and ¾ mile south of the Red River. It is 1,930 ft. from the east line and 2,800 ft. from the south line of Block 1, BBB&C Survey, Abstract 61.

Eason Oil Co. 1 Temple Yarbrough Trust is a new 4,500-ft. wildcat 4 miles north of St. Jo in Montague County. It is located 2,150 ft. from the north line and 1,231 ft. from the west line of F. J. Bellows Survey, Abstract 33, and is about 4 miles east of the Bonita field.

Electra field, Wichita County, had four completions this week and Madden field, Wichita County, Ross field, Clay County, and Holliday field, Archer County, each had one. Nocona field, Montague County, had five locations, and Wilson field, Cooke County, had three. National field, Wilbarger County, had nine drilling wells; Holliday field has seven Garvey field, Young County, five; Knox field, Young County, four, and Woodbine and Sivell's Bend fields, Cooke County, each have three.

In West Central Texas, Shackelford County Regular field had two completions and Manning-O'Connor field, Stephens County, and Jones County Regular field each one. Reddin field, Taylor County, and Manning-O'Connor field each had one location. Jones County Regular field has six drilling wells; Manning-O'Connor field, five; Reddin field four, and Cisco field, Eastland County, Sanders field, Taylor, and Santa Anna field, Coleman County, two each.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCAT

Young County: New oil pool—Jno. T. Cox et al 1 R. W. Davis, SPRR Sur. A-264, 4 mi. N and ½ mi. E Eliasville, elev. 1,322 ft., IP 70 bbl. day, perf. 3,558-61 ft. Caddo, gravity 40°, TD 3,476 ft.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Cooke County: Russell Maguire 1 W. H. Campbell, M. Alexander Sur. A-6, 3 mi. W and 1 mi. N Lindsay, dry, TD 2,001 ft.

Wichita County: W. M. Meredith 1 L. H. Klinkerman, Blk. 263, Waggoner Colony land, 6½ mi. N and 2 mi. E Electra, dry, TD 1,936 ft.

Young County: Champlin Refg. Co. 1 G. E. Bartholomess, BBB&C Sur. A-34, 2 mi. N and 1 mi. W Loving, elev. 1,177 ft., Ellenburger 5,343 ft., dry, TD 5,435 ft.

WEST CENTRAL TEXAS SUCCESSFUL WILDCAT

Jones County: New oil pool—M. E. Hart 1 Morrison Est., D. T. Bruce Sur. No. 135, 4½ mi. SW Hodges, elev. 1,696 ft., pumped 91 bbl. day through open 2-in. tubing, perf. 2,172-83 ft. Flippen, gravity 41°, TD 2,186 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Coleman County: L. W. Elliott, Tr., 1 C. L. Eads, J. West Sur. No. 276, 4½ mi. NE Shields, elev. 1,346 ft., Marble Falls 2,224 ft., dry, TD 2,355 ft.

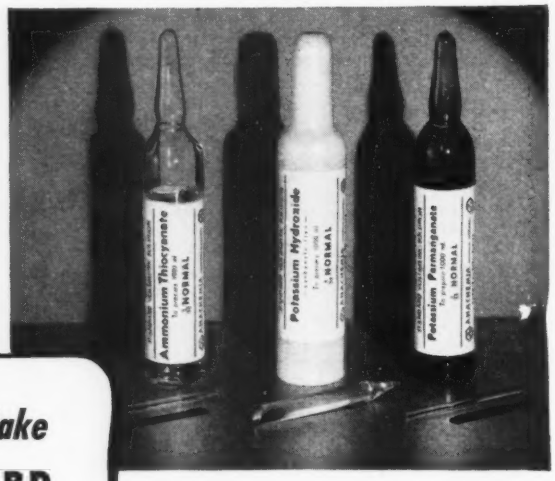
Jones County: Bennett & Sorrels 1 Wm. C. Eoff, Austin & Williams Sur. No. 338, 3 mi. SE Hamlin, elev. 1,740 ft., Swastika sand 3,313 ft., dry, TD 3,334 ft.

Clark & Cowden 1 J. S. Reeves, M. R. Longorio Sur. No. 258, 1 mi. S Truby, elev. 1,679 ft., King 2,384 ft., dry, TD 2,744 ft.

F. J. Hart 1 M. D. Myatt, Sec. 1, Blk. 15, T&P Sur., 1 mi. N Nugent, elev. 1,598 ft., dry, TD 2,003 ft.

Shackelford County: R. H. Roark et al 1 Lynch, Sec. 9, Blind Asylum land, 5¼ mi. E Albany, elev. 1,332 ft., Mississippian 4,380 ft., Chappell 4,468 ft., Ellenburger 4,478 ft., dry, TD 4,504 ft.

Texas & Pacific 1 C. B. Snyder, Sec. 36.



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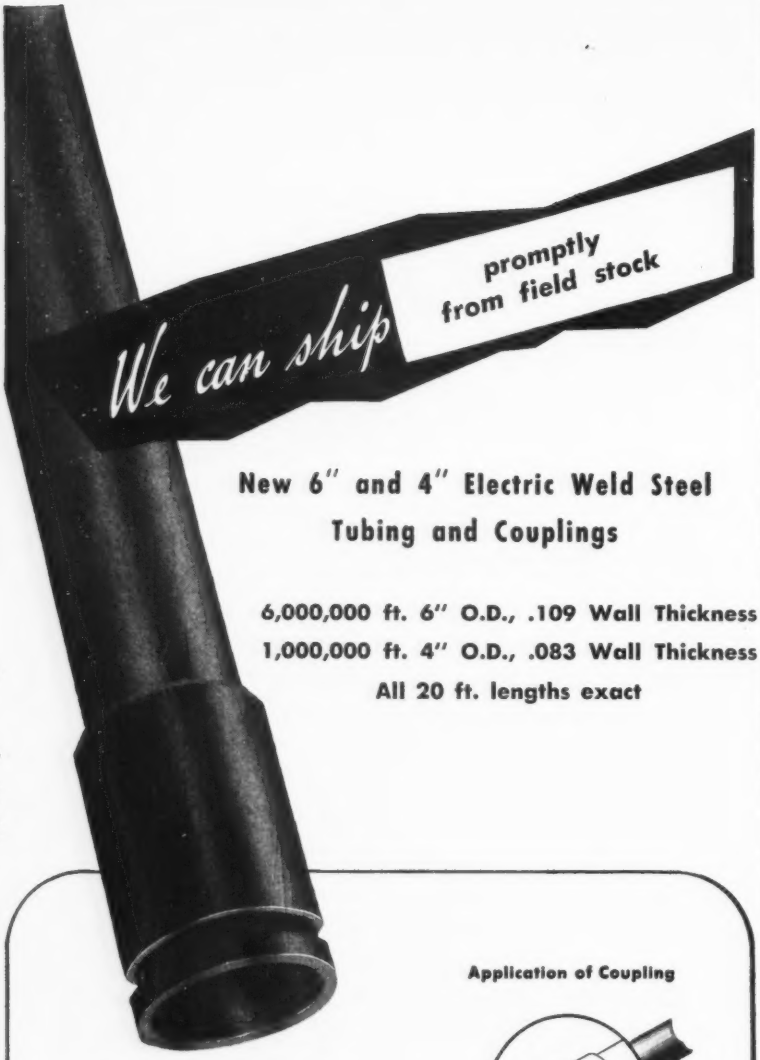

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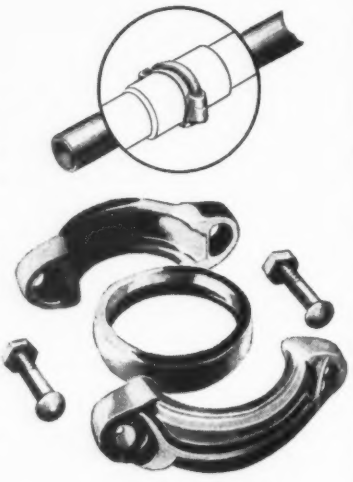

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Lunatic Asylum land, 3 mi. W Moran, elev. 1,406 ft., dry, TD 4,186 ft., Mississippian 4,136 ft., Ellenburger 4,158 ft.

Stephens County: Palmer Oil 1 L. A. Caudle, R. S. Owings Sur. A-132, 6¾ mi. N Tom Corbett, elev. 1,241 ft., Marble Falls 4,045 ft., Ellenburger 4,850 ft., dry, TD 5,150 ft.

ILLINOIS

Three Discovery Wells Completed During Week

MATTOON.—Illinois operators have completed three discovery wells during the past week, opening two new pools and extending the Phillipstown pool. The two new pools were both in Wabash County. Apparently the best of these were opened by the Sam Malis et al 1 W. L. Litherland, NW NW SE 20-1n-13w, about 2½ miles northwest of the Friendsville field. The 1 Litherland pumped 160 bbl. of oil and 10 bbl. of water in 24 hours on initial production test. Production was through perforations opposite the McClosky lime at 2,720-32 ft. following an acid treatment of 2,000 gal.

The second discovery was made by the Magnolia Petroleum Corp. at the 1 W. J. Pfeiffer, SE NE NW 11-2s-14w, midway between the Keensburg and South Browns pools. This well pumped 12 bbl. of oil daily from perforations opposite the Cypress sand at 2,596-2,601 ft. It was drilled to a total depth of 3,050 ft., but plugged back to 2,609 ft. when lower horizons failed to yield any oil.

The J. W. Thompson 1 Emma Bruggen, NE NW SW 13-5s-10e, extended the Phillipstown pool of White County about 1 mile to the southwest when it was completed on pump for 20 bbl. per day. Producing formation is the McClosky lime at a depth of 3,150-80 ft. and 3,192-3,207 ft., total depth, and it was treated with a total of 1,500 gal. of acid.

Two miles northeast of the Phillipstown pool, the Inland Producers, Inc., 1 Reister, SE NE NE 15-4s-10e, showed promise of opening a new area when it swabbed 10 bbl. of oil in 8 hours after perforating at 3,125-31 ft. in the McClosky lime. The oil tested 45° gravity.

Illinois completions showed a slight upward trend during the past week as operators finaled 30 oil wells and 21 dry holes. Included in these were eight wildcats, three of which were successful. New operations remained about on a level with the previous week with a total of 59 tests announced. Included in the new operations were 17 exploratory tests, 3 in Wabash County, 2 each in Wayne, Gallatin, White and Marion counties, and 1 each in Clay, Coles, Edgar, Hamilton, Jasper and Cumberland counties.

ILLINOIS SUCCESSFUL WILDCATS

Wabash County: Sam Malis et al 1 W. L. Litherland, NW NW SE 20-1n-13w, pumped 160 bbl. oil and 10 bbl. water, 2,000 gal. acid, perf. 2,720-32 ft., McClosky 2,720-32 ft., 2,744-57 ft., TD 2,808 ft.

Magnolia 1 W. J. Pfeiffer, SE NE NW 11-2s-14w, pumped 12 bbl., perf. 2,606-08 ft., 2,597-2,601 ft., Cypress sand 2,596-2,610 ft., TD 3,050 ft., PB 2,609 ft.

White County: J. W. Thompson 1 Emma Bruggen, NE NW SW 13-5s-10e, pumped 20 bbl., 500 gal. acid, reacidized 1,000 gal., McClosky 3,150-80 ft., 3,192-3,207 ft., TD 3,207 ft.

ILLINOIS WILDCAT FAILURES

Bond County: R. L. Robbins 1 Outhouse, SW SW SE 15-4n-1w, dry at 1,452 ft., Glen Dean 1,125 ft., Golconda 1,188 ft., Barlow 1,256 ft., Benoist sand 1,415 ft.

Crawford County: C. C. Boyd 1 Decker, N½

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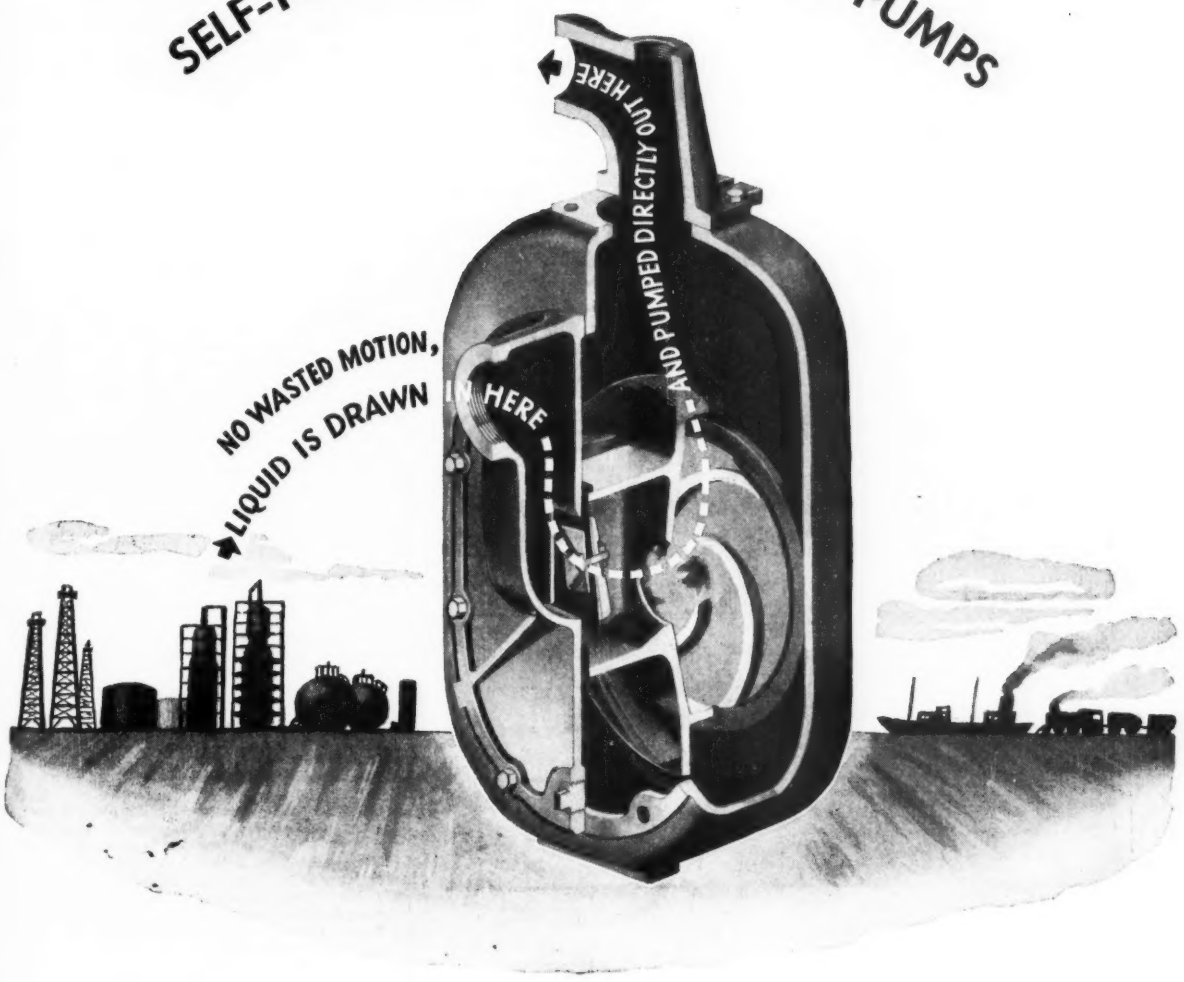

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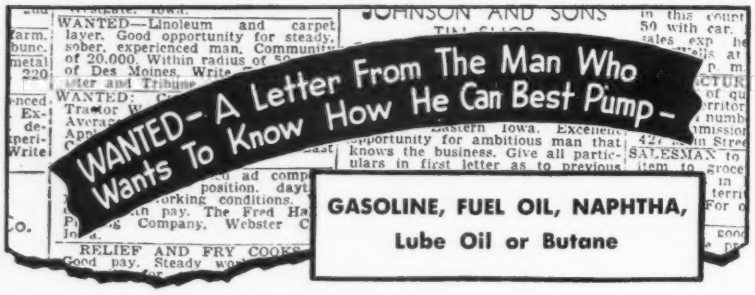
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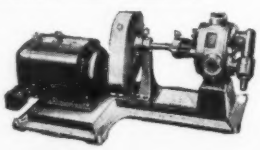

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NW SW 29-8n-12w, dry at 1,018 ft., slight show oil 965-98 ft.

Wayne County: C. E. Skiles and Reasor 1 M. Watkins, NW SE SW 20-1n-7e, dry at 3,276 ft., Glen Dean 2,622 ft., Cypress sand 2,811 ft., Renault 3,144 ft., Ste. Genevieve 3,184 ft., Fredonia 3,222 ft., McClosky 3,223 ft.

White County: Texas Co. 1 J. M. Douglas, SE SW NE 17-7s-8e, dry at 3,214 ft., Tar Springs 2,322 ft., Glen Dean 2,425 ft., Cypress sand 2,681 ft., Benoist sand 2,857 ft., Renault 2,956 ft., Aux Vases sand 2,984 ft., Ste. Genevieve 3,019 ft., Levias 3,036 ft., McClosky 3,090 ft.

National Associated Pet. Co. 1 E. J. Backman, SW NW NW 16-5s-9e, dry at 3,305 ft., Tar Springs 2,613 ft., Glen Dean 2,670 ft., Cypress sand 2,940 ft., Benoist sand 3,075 ft., Aux Vases 3,204 ft., Ste. Genevieve 3,230 ft.

OHIO, KENTUCKY

One-Mile Extension for Ashland Gas Field

COLUMBUS.—A 1-mile extension to the Ashland field was completed by the Ohio Fuel at 1 Howard Jones, Section 12, Montgomery Township, Ashland County. The Clinton sand at 2,649-55 ft. gaged 607,000 cu. ft. natural with a rock pressure of 890 psi.

South of Crooksville, in Bearfield Township, Perry County, Ohio Fuel 1 Calvin Embrey, Section 22, gaged 874,000 cu. ft. in the Clinton at 3,766-96 ft., and 320,000 cu. ft. in the Medina at 3,872-76 ft. Bert Davis and the Ohio Fuel have each staked another location in the pool.

The northeast part of Dover Township, Tuscarawas County, has proven to be good gas acreage. The latest completion, Brendel 1 R. M. Scharr, Lot 22, had a small pay in the Red Clinton and 694,000 cu. ft. in the White Clinton. After shot the well was shut in at 883,000 cu. ft.

The farthest east location in the Hemlock Grove pool, Nollem Oil & Gas 3 Oris Gaul, Section 33, Orange Township, Meigs County, made 23 bbl. after shot. Berea sand was found at 1,740-52 ft. This producer will encourage drilling on the east side of the pool.

The Industrial Gas Corp. has rigs built on two wildcats in Morgan County; 1 H. H. Bankes, Section 20, Deerfield Township, and 1 Frank Northrup, Section 9, Malta Township.

Of the 21 locations reported this week, Ashland had 7, Cambridge and Lancaster 4 each, and each of the other three fields 2 each. Lancaster led in completions with 6 of the 28 reported.

OHIO SUCCESSFUL WILDCAT

Muskingum County, Newton Township: John Morrow et al 1 Eugene Good, Section 25, Clinton 3,728-88 ft., 25 bbl., TD 3,798 ft.

OHIO WILDCAT FAILURES

Mahoning County, Austintown Township: East Ohio Gas Co. 1 A. and M. Lloyd, Lot 55, Oriskany 3,428-39 ft., TD 3,555 ft.

Meigs County, Orange Township: Theiss et al 1 Coolville Bank, Section 17, Berea 1,654-67 ft., TD 1,723 ft.

Muskingum County, Salt Creek Township: Industrial Gas Co. 1 Sidney Whitmire, Section 26, Clinton 4,324-74 ft., Medina 4,433-39 ft., Trenton 5,800-6,591 ft., St. Peter 6,704 ft., TD 6,740 ft.

WESTERN KENTUCKY

OWENSBORO.—H. H. Weinert has apparently discovered a new gas pool in Hopkins County with his 1 J. R. Breeden, 23-L-26. A 20-minute drill-stem test of the Pennsylvanian sand at 1,530-50 ft. resulted in the recovery of gas in 2 minutes esti-

mated at 3,000,000 to 5,000,000 cu. ft. daily.

Oil shows were encountered in several formations, but a 1-hour drill-stem test of the most promising of these, the McClosky lime at 2,761-81 ft., recovered only a slight amount of oil-cut mud and salt water along with some gas. The well was drilled to a total depth of 2,880 ft., but was plugged back to 1,700 ft. and 5½-in. pipe set at that depth.

Only one dry hole and one oil well were completed in western Kentucky during the past week, and neither of these were wildcats. Nine new operations were announced.

EASTERN KENTUCKY

ASHLAND.—Kentucky & West Virginia Gas Co. brought in the only gas completion during the past week in the Eastern Kentucky field of operations.

Well No. 807 on the W. R. Hall, Sr., property in Floyd County was noted at a depth of 3,168 ft., with 146,000 cu. ft. of gas in shale, after shot.

INDIANA

EVANSVILLE.—George & Wrather Drilling Co. was drilling ahead at the close of the week at its Vanderburgh County wildcat, the 1 Mahler, SW SW SE 6-5s-11w. The well is now below the 2,500-ft. mark and in the Benoist sand. No shows of oil or gas have been encountered as yet, but the well is reportedly running structurally high in comparison with previous tests drilled in the area.

Indiana operations remained at about a level with the previous week, with five oil wells and one dry hole reported. No wildcat completions were noted. New operations announced during the past week totaled five, all field development wells, and included three in Pike, and one each in Posey and Vanderburgh counties.

LA.-ARK.

Pool-Opener Pumping 100 Bbl. Daily

EL DORADO.—McAlester Fuel Co.'s discovery, 1 Adams Estate, in SW SW 16-16s-24w, near Lewisville in Lafayette County, late last week was still pumping about 100 bbl. of oil a day at 3,977-92 ft.

Other wildcat activity included McAlester's 1-A Alexander, NE SE 17-17-19, which was drilling below 7,270 ft. in Buckner sand and looking for lime. This well is expected to extend the Village field production approximately 1 mile. Spartan Drilling Co. was making hole after setting surface casing at its wildcat, the 1 Longino-Goode Unit, NW SE 34-17-23, on the west edge of Columbia County. Atlas Oil & Refining Co.'s 1 R. A. Wynns, SW SW 8-16-19, 5 miles northeast of McNeil, was drilling below 5,000 ft.

In Lafayette County, near Nevada County's shallow oil field, Ray & Wolfe were drilling ahead at an unannounced depth at the 1 Wade Kitchens, SE NW SE 17-15-22. This area was reported to have had three wells drilled several years ago which produced a black oil, too heavy to flow.

ARKANSAS SUCCESSFUL WILDCAT

Ouachita County: Joe Mucher Tr. 1 Josie Smith, C NE SE SW 30-15s-17w, Pace City discovery well, pumped 45 bbl. of 28°-gravity oil per day from Glen Rose at 2,758-62 ft., Midway 1,086 ft., Nacatoch sand 1,750 ft., Saratoga 1,940 ft., Annona 2,170 ft., Base Annona 2,203 ft., first Blossom 2,354 ft., second Blossom 2,447 ft., third Blossom 2,480 ft.; fourth Blossom 2,520 ft.; Tokio 2,565 ft.; TD 3,569 ft.

NORTH LOUISIANA WILDCAT FAILURES

Madison Parish: J. M. Snowden 1 MacNeille, C NW SE NW 25-17n-13e, dry, TD 4,977 ft., no tops reported.

Richland Parish: Lion Chemical Co. 1 Tensas Delta, C NW SW 22-14n-5e, dry, TD 4,524 ft., Midway 2,874 ft., Clayton 3,491 ft., Gas Rock 3,506 ft., Basal chalk 3,682 ft., Basal Ozan 3,711 ft.

OKLAHOMA

Cotton County Wildcat Cores Saturated Sand

AS the drilling activity in Cotton County continued to gain momentum through the past week, another new pool was in prospect for the southern part of the county. Akin and Dimock 1 R. C. Brown, NE SW SW 6-5s-12w, 2½ miles southwest of Randlett and about the same distance north of the Red River, topped what is believed to be the Thomas sand of the Cisco series at 1,570 ft. and cored saturation to 1,577 ft. An electric log was run and casing set on top of the sand. This new well is less than ½ mile southeast of a 3,405-ft. dry hole in NE NE SE 1-5s-13w.

Rapid development continues to follow the discovery of new fields in the county, and new exploratory tests appear daily. Wildcat activity, however, is being slowed down by the shortage of drilling rigs, and several block holders are trying to induce outsiders to move in more equipment.

Also in Cotton County, the old Walters pool, discovered in 1917, appeared to have a new pay horizon when the Earl P. Halliburton, Inc., 1 Tilley, SW SW NE 23-1s-10w, encountered a sand at 2,325-48 ft. which produced 420 ft. of clean oil on a drill-stem test. Casing was set on top of

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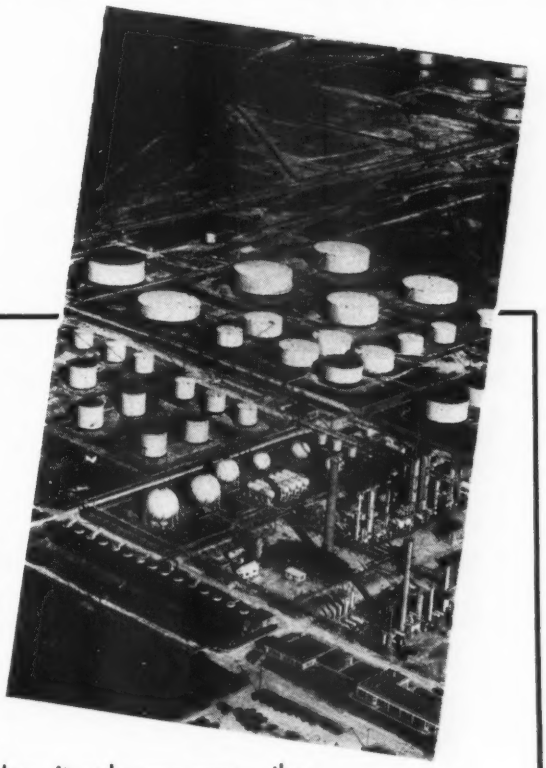

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the sand with testing scheduled to start at the beginning of the week.

A new Bartlesville sand pool northeast of the three Mehan pools, southeast of Stillwater in Payne County, was indicated last week by the Fleet Drilling Co. et al 1 Ball, NE NE SW 10-18n-3e. A 1-hour drill-stem test of the Bartlesville at 3,927-50 ft. recovered 225 ft. of high gravity oil and an estimated 250,000 cu. ft. of gas. The well is now shut down and casing is to be set for testing.

The Kenwood Oil Co. et al 1 Hummel, SW SW SE 28-10n-3w, came in at the close of the week flowing 260 bbl. of oil daily from the Bartlesville sand to extend the West Moore field of Cleveland County approximately ½ mile to the east. Total depth is 8,012 ft. and pipe is set at 7,880 ft. The 1 Hummel is the first producer completed of the former Navy auxiliary flying field.

OKLAHOMA SUCCESSFUL WILDCATS

Hughes County: Leach & Warren 1 N. A. Dennis, NE SE NW 7-9n-10e, discovery well, produced 7,500,000 cu. ft. of gas from sand at 3,102-8 ft., lime 2,590-605 ft., shale 2,605-79 ft., Booch sand 2,679-95 ft. with a show of oil, sandy shale 2,695-703 ft., shale 3,095-102 ft., TD 3,108 ft.

Nu-Enamel 1 Townsend, NE SW NW 7-9n-10e, gas discovery well, produced 4,500,000 cu. ft. of gas from Cromwell at 3,455-512 ft., Lower Wewoka 610 ft., Calvin zone 800 ft., Earlsboro 2,450 ft., Booch 2,729 ft., Wapanucka-Cromwell zone 3,470 ft., TD 3,512 ft.

Oklahoma County: Denver 1 M. Murphy, NW SE 11-13n-4w, flowed 15 bbl. of oil per day from Oswego at 6,260-350 ft., Oolitic lime 5,762-92 ft., Hunton-Herrington 6,530-615 ft., Sylvan 6,735 ft., TD 6,735 ft.

Osage County: A. G. Oliphant 1 Osage, SW NE NE 21-25n-4e, pumped 30 bbl. of 42°-gravity oil per day from Cleveland at 2,855-80 ft., TD 3,571 ft.

OKLAHOMA WILDCAT FAILURES

Cimarron County: Sinclair-Prairie Oil Co. 1 State Tract No. 44, C NW NW 28-6n-5ecm, dry, TD 5,582 ft.

Cotton County: Claude A. and Carl Johnston 1 Gandy, SE SE SE NW 29-3s-9w, dry, TD 1,830 ft., no tops reported.

Layton & Humphries 1 Parrish, SE SE NE SE 32-2s-11w, dry, TD 2,020 ft., no tops reported.

S. D. Johnson 1 J. M. Cooper, NE NW NE NE 9-3s-11w, dry, TD 2,210 ft., sand 1,659-66 ft. and 1,770-810 ft.

C. V. Richardson et al 1 Dodge, SW SW SW NE 4-4s-10w, dry, TD 1,517 ft., no tops reported.

L. H. Choate et al 1 E. Graham, SE SE SE NW 15-4s-11w, dry, TD 1,750 ft., no tops reported.

Garvin County: Anderson-Pritchard et al 1 Shumate et al, SW SE SW 10-3n-2e, dry, TD 3,013 ft., Burns sand 2,856-74 ft., Simpson sand 2,967-3,012 ft.

Logan County: Frank Russell 1 Griffin, SE SE NW 33-15n-1w, dry, TD 6,125 ft., Oswego 4,770 ft., Bartlesville 5,508-12 ft., Base Pennsylvanian 5,560 ft., Woodford 5,586 ft., Misener 5,700 ft., Sylvan 5,703 ft., Viola 5,805 ft., Simpson 5,842 ft., dolomite 5,920 ft., Wilcox 6,005 ft., sandy dolomite 6,070 ft.

McCurtain County: Sam Green 1 J. C. Hartline, NE SW SE 2-7s-21e, dry, TD 4,347 ft., sand 230-70 ft., 420-65 ft. with a slight show of gas, and 608 ft. with a slight show of gas, Collier shale 2,454-589 ft., sandy lime 3,400 ft., sand 4,249-60 ft. with a slight show of gas, chalky lime 4,265-70 ft.

Oklahoma County: Phillips Petroleum Co. 1 Umpleby, NW NW NW 2-14n-1w, dry, TD 5,975 ft., Woodford 5,455 ft., Viola 5,660 ft., first Wilcox 5,797 ft., Bromide 5,874 ft.

Pawnee County: A. W. Swift 1 State, SE NE SW 33-20n-9e, dry, TD 2,065 ft., sand 884 ft., Cleveland 1,325 ft., coal 1,458 ft., Oswego 1,793-840 ft., Prue 1,872-8 ft., lime 1,919 ft. and 1,930-34 ft., shale 1,934-2,035 ft.

Pottawatomie County: Charles F. Balph 1 J. Jones, NE NE SW 12-11n-6e, dry, TD 3,100 ft., Hogshooter 1,530 ft., Oswego 2,710 ft., Calvin 2,715 ft., Pennsylvanian sand 2,776-846 ft., 2,888-924 ft., and 2,938 ft.

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MISSISSIPPI

Mississippi Development Continues at Steady Rate

JACKSON.—A summary of this week's activity in Mississippi includes 7 completions, 1 of which was a dry wildcat, 60 active field developments, 16 operating wildcats, and a total of 7 new locations, 4 field and 3 wildcat wells.

In Cranfield field, California Co.'s 20 Ella G. Lees, 29-7n-1w, Adams County, was completed after perforating for an initial production of 305 bbl. of 39.1°-gravity oil per day from Massive sand. Flow was through a 9/64-in. tubing choke, tubing pressure was 1,675 lb. and total depth 10,310 ft. The company's 3 Homochitto Lumber Co.-Lease No. 3, 29-7n-1e. Franklin County, same field, flowed 247 bbl. of 39.3°-gravity oil per day through a 9/64-in. tubing choke from Massive sand. The well was perforated at 10,282-314 ft., and bottomed at 10,338 ft.

Humble Oil & Refining Co. 1 J. K. Straas "B" Unit, 14-9n-1e, Jefferson County, Fayette field, was completed at 9,662 ft. for 138 bbl. of 37.4°-gravity oil per day, and Kirby Petroleum Co. B-4 Long Bell Petroleum Co., 30-1n-18e, Clarke County, Langsdale field,

pumped 111 bbl. of 19°-gravity oil per day after completion at 3,780 ft.

In Monroe County, Florida's deepest wildcat hole, the Gulf Refining Co. 1 State-Lease No. 373, 2-67s-29e, is currently drilling below 12,060 ft. in dolomite and anhydrite, after several scattered but definite oil shows.

MISSISSIPPI WILDCAT FAILURE

Yazoo County: Sohio Petroleum Co. 1 J. Christopher-Texas Co., C NE NE SW 5-11n-2w, dry, TD 7,597 ft., Winfield 1,718 ft., Wilcox 2,067 ft., Midway 4,252 ft., conglomerate 5,122 ft., Eutaw 6,010 ft., Perry sand 6,029-44 ft., Lammons zone 6,216-518 ft., Tuscaloosa 6,750 ft.

FLORIDA WILDCAT FAILURE

Dade County: Gulf Refining Co. 1 State-Model Land Co., unsurveyed-60s-35e, dry, TD 6,030 ft., no tops reported.

KANSAS

Extensive Development Planned at Hugoton

REPRESENTATIVE of the increasing interest in the development of natural gas reserves was the announcement recently of Stanolind Oil Co. of a large development program in the Hugoton field of Oklahoma and Kansas. Stanolind holds more than 1,000,000 acres of proved and potential gas leases in and around the field and will spend several million dollars during the next few years in development of these leases. Approximately half of the expenditure will be for lease acquisitions and development of gas reserves while the remainder of the expenditures will be for research, planning and construction of a synthesis plant. Stanolind's original drilling program called for about 100 wells to be drilled during 1946, and 57 of these have been completed or are drilling at the present time.

Exploratory activity in Kansas during the past week was confined to more or less routine stages of drilling with no important showings reported from any of the several wildcats under way at present. Wildcatting continues to be somewhat slow, with only a small percentage of the new tests announced each week being classified as exploratory ventures.

One of the most interesting wildcat starts during the week was the Cities Service Oil Co. 1 Blatter, SW SW SW 13-25-16w, Edwards County. This test is about 3 miles east of the Belpre gas pool and about 4 miles southwest of oil production in the Farmington pool. It is on a block of approximately 3,200 acres.

KANSAS WILDCAT FAILURES

Butler County: Dave Alter & Brackenseik 1 Swindel, NE NE NW 22-28s-3e, dry, TD 3,178 ft., Lansing-Kansas City 2,085 ft., Kansas City 2,345 ft., Mississippi lime 2,833 ft., Basal Mississippi lime 3,036 ft., Simpson 3,125 ft., Arbuckle 3,160 ft.

Ellsworth County: Royer & Farris 1 Rozelle, SW SE NE 21-16s-8w, dry, TD 3,450 ft., Lansing-Kansas City 2,686 ft., conglomerate 3,078 ft., Maquoketa 3,233 ft., Viola 3,321 ft., Simpson 3,388 ft., Arbuckle 3,436 ft.

Pratt County: Stanolind Oil & Gas 1 A. A. Humble, SW SW SW 4-29s-12w, dry, TD 4,695 ft., anhydrite 734 ft., Lansing-Kansas City 3,832 ft., Mississippi lime 4,260 ft., Viola 4,423 ft., Simpson shale 4,523 ft., Arbuckle 4,644 ft.

Sumner County: Fred U. T. Smith 1 Mason, C NE SW 11-34s-2w, dry, TD 4,695 ft., Topeka 2,260 ft., Heebner 2,545 ft., Lansing-Kansas City 3,462 ft., Layton 3,390 ft., Basal Kansas City 3,530 ft., Big lime 3,552 ft., Mississippi lime 4,041 ft., Simpson 4,522 ft., Arbuckle 4,638 ft.

CALENDAR

October

Houston Nomads, Old College Inn, Houston, October 14.

East Texas chapter, American Petroleum Institute, fall meeting, October 15, Kilgore.

Texas Mid-Continent Oil and Gas Association, Rice Hotel, Houston, October 17-18.

Texas Railroad Commission, state-wide proration hearing, Austin, October 19.

American Institute of Mining and Metallurgical Engineers, Petroleum Division, annual meeting, Ambassador Hotel, Los Angeles, October 24-25.

American Association of Petroleum Geologists, midyear meeting, Buena Vista Hotel, Biloxi, Miss., October 24-25.

Independent Petroleum Association of America, annual meeting, Fort Worth, October 28-30.

Midwest Gas Association and Iowa State College Gas School and Conference, Ames, Iowa, October 28-30.

November

Los Angeles Nomads, Fall Festival, Mayfair Hotel, Los Angeles, November 2.

Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa, November 7-8.

Houston Nomads, Old College Inn, Houston, November 11.

A.P.I. annual meeting, Stevens Hotel, Chicago, November 11-14.

Los Angeles Nomads, Mayfair Hotel, November 13.

American Welding Society, annual meeting, Atlantic City, N. J., November 18-22.

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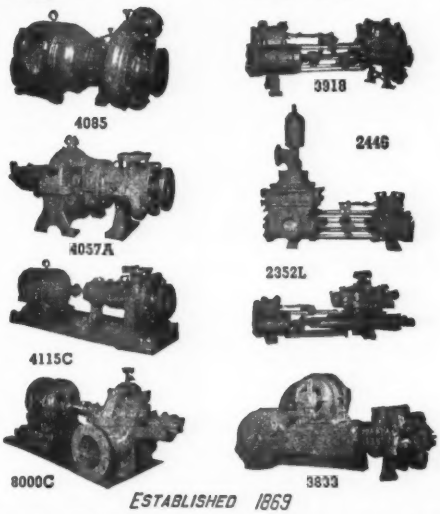

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Among the

Drilling Contractors

Dunlap & Graham, Long Beach, received contract for W. L. Hernstadt 1 Hernstadt, 24-27s-19e, a redrilling job in the Antelope Hills field, Kern County, California.

Crow Drilling Co. has contract to drill Atlas Oil & Refining Co.'s wildcat in a block formed by Walter Kieth in 4-14s-19w some 3 miles northeast of the Troy field, Ouachita County, Arkansas. Contract depth is 4,000 ft.

Shamrock Drilling Co., Los Angeles, has acquired an 80-acre lease in the Midway-Sunset area, Kern County, California, and is planning to start a well for its own account in 23-31s-22e.

Boyle Bros. Drilling Co. is resuming work on a series of diamond drill structure tests for T. Boyd Kyle and associates of Calgary in the Hay River area south of Great Slave Lake. The tests, on the southern fringe of the Northwest Territories, are the most northerly drilling at present in Canada.

I. F. Scott is drilling contractor on the Gulf Refining Co. 1 Bertha Jacobson, in NE NE NE 11-21n-9w, Wexford County, Michigan.

Santa Maria Drilling Co., Santa Maria, Calif., is the contractor on A. W. Lyddon, Operator, 7-1 Holtz, 7-6s-10w, Huntington Beach - West Newport area, Orange County, California.

Delta Drilling Co. was rigging up at Magnolia Petroleum Co.'s 1 Hall estate, in the M. W. Moody Survey, Marion County, Texas. The projected 11,000-ft. test is north of the 1 Orr, Lassater discovery, and is the second well in the area.

Hoyt Drilling Co., Long Beach, is moving in rotary equipment to drill Amerada Petroleum Corp. 64-7 Anaheim Sugar Co., 7-6s-10w, in the Huntington Beach area, Orange County, California.

Texas State Drilling Co., Houston, will drill a new wildcat in the Elm Bayou area of Chambers County, Texas. The test, about 1½ miles west of gas production, will be the 1 D. Lundguist Unit, in Section 91, HT&B Survey. The Texas Co., Sun Oil Co., Atlantic Refining Co. and Gulf Oil Corp. are said to have acreage in the immediate vicinity.

Pacific Drilling Co., Long Beach, has spudded Wood-Callahan Oil Co. 1 Coyote, 4-3s-9w, in the Olinda area, Orange County, California.

Commonwealth Drilling Co., Calgary, Alta., has spudded Sun Oil CPR 1, LSD 11, 8-18-16w4, in the Eyremore district of Alberta. This is Sun Oil's first test in the province.

Brown Drilling Co., Long Beach, has been engaged to drill Standard Oil Co. of California 3 Elliott in the Rio Vista gas field, northern California.

Hinkle Drilling Co.'s discovery, more than a mile northwest of production in the Port Neches field of Orange County, Texas, was given a potential of 300 bbl. of 37.4° gravity oil in 24 hours through 10/64-in. choke, with 1,400 lb. flowing pressure on the tubing. Production is from perforations at 8,774-78 ft., with total depth at 8,954 ft.

T. J. Conway, Tyler, Tex., was reported to have moved in a deep-well rig in western Cass County, East Texas, where Atlas Oil & Refining Co. of Shreveport purchased a block of some 3,300 acres from Southwood Exploration Co. of Dallas. Atlas was scheduled to have spudded in at a 5,500-ft. wildcat test on the block at its 1 Laura Thomas, 7 miles southeast of Naples, in the W. G. Anderson Survey.

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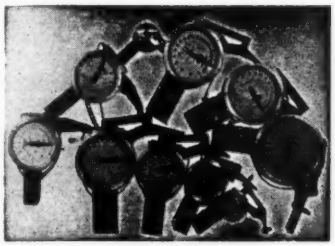

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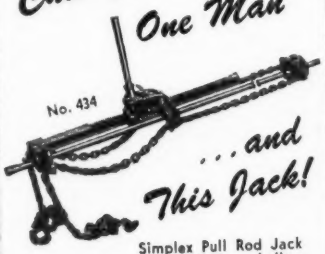

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Ralph M. Parsons Co., Los Angeles, has received three new drilling contracts. Two wells will be drilled for Atlas Production, Inc., in the West Whittier field, Los Angeles County, and contract has been made to drill Richfield Oil Corp. 1 Tapo, Simi area, 29-3n-18w, Ventura County, California.

Holmes Drilling Co. and John B. Coffee were reported rigging up to get under way this week at their wildcat test on the north flank of the West Columbia dome in Brazoria County, Texas. Location of their 1 A. P. George is on a 145-acre lease out of a 927-acre tract in the George Tennille Survey, Abstract 131. It is within ½ mile of shallow production on the dome but is scheduled to test to 7,000 ft.

Rocky Mountain Drilling Co., Los Angeles, is drilling at shallow depth on Standard Oil Co. of California et al 2 Six Companies fee, 2-3s-15w, El Segundo area, Los Angeles County, California. This is second location in a discovery area. The discovery well was drilled under Shell Oil Co., Inc., supervision.

H. S. Tenny, Torrance, has contract to drill Standard Oil Co. of California 1 Newsom community, in the Santa Fe Springs area, Los Angeles County, California. Location is in 36-2s-12w.

Here is a view of the Blalack & Walter Drilling Contractors 1 Ammons, located in 14-12n-7e, Coles County, Illinois, which caught fire when it came in. There had been an electrical storm just before the fire, and the photographer caught a flash of lightning in the picture

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PERSONALS

Hargrove Steps Up To Presidency Of A.G.A.

REGINALD H. HARGROVE, vice president and general manager, United Gas Pipe Line Co., Shreveport, La., was elected president of the American Gas Association at the annual convention and exhibition of the association in Atlantic City, N. J., this week.

Born in Marshall, Tex., Hargrove studied engineering at Rice Institute in Houston after his graduation from high school in Shreveport. He entered the first officers' training camp at Fort Logan H. Root, Arkansas, in May 1917 and was commissioned a second lieutenant in the Coast Artillery Corp. Of his 2 years' service with the Army, 5 months were spent in France.

Hargrove entered the public-utility field in 1928 with the land department of Palmer Corp., which later became a subsidiary of United Gas Corp., handling oil and gas leases and contracts for the company. The following year he was elected vice president of Louisiana Gas & Fuel Co. and its subsidiaries.

In 1930, following the organization of United Gas Corp., he was elected vice president of all active domestic subsidiaries of that company. In 1937 he became vice president and general manager of the newly organized Union Producing Co., United Gas Pipe Line Co., and United Oil Pipe Line Co. In 1944 he was elected vice president of United Gas Corp., parent company of the United Gas group.

Recognized as one of the outstanding natural-gas men of the nation, Hargrove has been active in A.G.A. affairs for many years and has served on many committees representing the natural-gas section of the industry. Last year, as first vice president, Hargrove served as chairman of the Natural Gas Department of the association.

Robert D. Walker, sales engineer for Oilfield-Industrial Export, Inc., left New York in September for a 6 months' trip to the fields of Trinidad, Venezuela, Colombia, Ecuador, and Peru, in the interest of the company's accounts, Lee C. Moore & Co. and Guiberson Corp.

Whitney Weinrich has joined the chemical-engineering department of the University of Pennsylvania. During the war he was a member of the refining division of the Petroleum Administration for War and more recently was with the research and chemical engineering departments of Phillips Petroleum Co.

George P. Gregory, Jr., manager of export for George E. Failing Supply Co. and W-K-M Co., Inc., left Buenos Aires September 22 for New York following a 3 weeks' business trip to Argentina.

Dr. Courtney C. Brown, head of the petroleum economics division of Standard Oil Co. (N. J.), has been appointed vice president of the World Trade Foundation of America.

W. A. BAKER

William A. Baker has joined Shell Pipe Line Corp. as vice president and treasurer. He has been assistant treasurer for Shell Oil Co., Inc., since he came to Houston 6 years ago. Previously, he served 7 years as Shell Oil comptroller in St. Louis, following 12 years in its Pacific Coast operations. **Herman J. Woehrmann** has been named Shell Pipe Line's assistant purchasing agent.

E. J. Ryan, district manager for Gardner-Denver Co. with offices in Rio de Janeiro, recently arrived in New York for a month's business trip to the company headquarters in Quincy, Ill.

William Naden and **H. Janney Nichols, Jr.,** have been named directors of Standard Oil Co. of New Jersey. Naden, manager of the company's

WILLIAM NADEN

H. J. NICHOLS, JR.

employe-relations department, joined the Colonial Beacon Oil Co. in 1927 as a chemist in its Everett, Mass., refinery, and later became general superintendent of the Jersey company's refinery at Baltimore. Nichols, general manager of the supply and transportation department, was first employed in the development department in 1923. Appointed head of the company's domestic-coordination committee in 1938, he was named to head the supply and transportation department in 1944.

L. Vincent Collings, general counsel for Standard-Vacuum Oil Co., has been elected to the board of directors of the company.

J. H. Puls has been appointed assistant manager of production for the Pacific Coast division of The Texas Co. **A. W. Sands** has been promoted to replace Puls as superintendent of drilling and production operations.

John T. Higdon, maintenance foreman of Shell Pipe Line Corp., has retired after more than 23 years' service with the company. He pioneered construction of the company's telephone lines in Oklahoma, Texas, New Mexico, and Illinois.

Dr. Alex G. Oblad, formerly chief chemist of the field research laboratories of Magnolia Petroleum Co., has joined the staff of the Texas State Research Foundation as head chemist and will serve as acting head of the foundation's chemical division. **Dr. D. R. Carmody,** former supervisor in charge of process research for Magnolia, has joined the foundation as supervisor in charge of process research and acting supervisor of organic-chemical research.

Frank M. Dawson has been elected vice president in charge of operations, and **Allen K. Brehm** treasurer of Car-

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F. M. DAWSON *A. K. BREHM*

thage Hydrocol, Inc., according to an announcement by **Guy George Gabrielson,** president. The company is making plans to synthesize gasoline and other petroleum and chemical byproducts from natural gas in a $15,000,000 plant to be erected near Brownsville, Tex. Dawson, a native of Houston, has been with The Texas Co. for 18 years, most recently as superintendent of its Lawrenceville, Ill., refinery. Brehm was formerly first vice president of Continental Bank & Trust Co., New York.

Judge Frank Feuille, vice president and director of California Commercial Co., Standard Oil Co. of California subsidiary, has retired after 26 years' service with California Standard and its subsidiaries. He served as an advisor on matters pertaining to Latin America.

W. D. Williams, drilling superintendent for Husky Refining Co. of Cody, Wyo., has arrived in Alberta to take over supervision of the company's drilling program in Lloydminster field.

R. D. Patch, coordinator of government projects at the Baton Rouge refinery of Standard Oil Co. of New Jersey, has been appointed assistant manager of the chemical-products division. **C. G. Morrison,** superintendent of the chemical-products division's alcohol and cracking and perbunan departments, has been named assistant manager of employe relations.

Other changes of Standard personnel at Baton Rouge include: **J. R. Vannoy,** of butyl operations, made general foreman of the cracking and perbunan department; **Dr. D. F. Edwards,** assistant head of the technical division, appointed assistant process superintendent of the division; and **J. F. Wright,** named head of the cost-analysis department, succeeding **C. M. Beamer,** who takes Dr. Edwards' place as assistant head of the technical division. The changes in assignment are in accordance with the policy instituted several months ago of shifting executive and supervisory personnel to broaden their experience and capabilities.

SHIFTS—

Leland H. Zollars, engineer, Magnolia Petroleum Co., Monroeville, Ala., to Andalusia, Ala.; **V. C. Latch,** superintendent, Signal Oil & Gas Co., Sunset Beach, Calif., to Cisco, Tex.; **J. S. Surfluh,** engineer, Standard Oil Co. of California, Taft, Calif., to Tupman, Calif.; **Jack R. Boyd,** engineer, Magnolia Pipe Line Co., Andrews, Tex., to Sarpeta, La.; **Louis Theaux,** superintendent, Olson Drilling Co., Crane, Tex., to Odessa, Tex.

Henry C. Owen, engineer, Celanese, Corp., Corpus Christi to Dallas; **Charles I. Reeves,** superintendent, Girard Corp., Corsicana, Tex., to Henderson, Tex.; **L. W. Davidson,** superintendent, Barbara Oil Co., Dallas to Wichita, Kans.; **Charles F. Koch,** superintendent, Magnolia Petroleum Co., Electra, Tex., to Smackover, Ark.; **Henry P. Griggs,** engineer, Williams Brothers Corp., Longview, Tex., to Shreveport.

James A. Parry, superintendent, Transwestern Oil Co., McFaddin, Tex., to Hebronville, Tex.; **C. A. Stassel,** foreman, Texas-New Mexico Pipe Line Co., Sunbeam, Tex., to Jal, N. M.; **S. Berger,** foreman, Phillips Petroleum Co., Trent, Tex., to Big Spring, Tex.; **Carl M. Landry,** engineer, The California Co., Algiers, La., to Rangely, Colo.; **W. R. McAllister,** foreman, Gulf Refining Co., Dubberly, La., to Lumberton, Miss.

Evan Watts, foreman, Magnolia Petroleum Co., Monroeville, Ala., to Andulusia, Tex.; **Lawrence J. Finfrock,** geologist, Carter Oil Co., Meridian, Miss., to Canton, Miss., **Fraser H. Allen,** engineer, Stanolind Oil & Gas Co., Upper Monclair, N. J., to Austin, Tex.; **James N. Wilson,** geologist, Seismograph Service, Erie, Colo., to Chandler, Okla.; **R. M. Brackbill,** engineer, Shell Oil Co., Inc., Oklahoma City to Elk City, Okla.

Russell R. Bacon, chief development engineer for Shell Oil Co., Inc., has been transferred from San Francisco to the company's Martinez, Calif., refinery. Other Shell transfers in California include: **Donald C. Nellis,** mechanical engineer, Sacramento to Ventura; **Roy E. Robinson,** drilling foreman, Bakersfield to Ventura; and **Frank A. Sikes,** mechanical engineer, Ventura to Bakersfield. **Robert D. Boylan,** refinery supervisor at Shell's Wilmington, Calif., refinery, has been promoted to assistant department manager, and **Richard N. Burnley,** technical assistant at San Francisco, has been named a technologist. Other recent Shell promotions include: **Oliver W. Holmes,** acting assistant department manager, Wilmington, to refinery shift supervisor; **Manford C. Alcorn,** pipe-line superintendent, Los Angeles, to assistant pipe-line manager; **Paul N. Heald,** technologist, San Francisco, to technical assistant.

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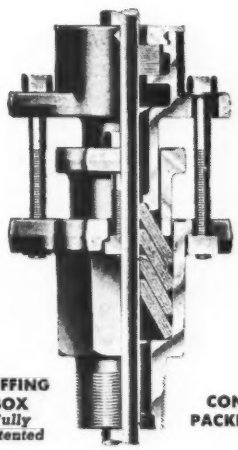

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Equipment Men in the News

Harder Leaves for London For Reed Roller Bit Co.

JAMES B. HARDER

James B. Harder, who recently joined Reed Roller Bit Co. as sales engineer after spending 4 years in the Pacific as a Naval lieutenant, left New York City September 24 for London where he will work, in addition to spending several months inspecting drilling operations in France, French North Africa, Egypt, and the Middle East. Harder joined the Reed company in 1938.

Denver Woffard, sales engineer for Reed Roller Bit Co., has returned to the states after a 6-month trip through the oil fields of Venezuela, Trinidad, Colombia, Peru, and Ecuador.

J. P. Cunningham Elected to Luscombe Board of Directors

James P. Cunningham, vice president in charge of production of Luscombe Airplane Corp., has been elected to the board of directors of Luscombe, L. H. P. Klotz, president, has announced. Cunningham joined Luscombe in 1942 as a member of the tool-design department. In 1943 he became chief production engineer and, in 1945, he was advanced to factory superintendent. He was appointed vice president in charge of production in April of this year.

Dowell Opens District Office in Cleveland

Dowell Incorporated, a wholly owned subsidiary of The Dow Chemical Co., announces through its general sales manager, R. D. Shaw, the opening of a district office in Cleveland on the sixteenth floor of the Terminal Tower Building.

Sales and operation offices under the supervision of the Cleveland district office are located in Cleveland, Buffalo, Detroit, Cincinnati, Pittsburgh, Hamilton, Medina and Wayne, Mich. The district will be under the management of E. C. Hardy who has been with Dowell since June 1933 following his transfer from the physical research laboratory of the Dow company at Midland, Mich. Dr. C. M. Loucks is being transferred from Dowell's Illinois district to Cleveland where he will be the district chemist. He joined Dowell in August 1943. Prior to this date he was a member of the faculty of Tulsa University at Tulsa.

Dowell has maintained a sales office in the Terminal Tower and an operating station at Medina since February 1, 1943. This office has been under the supervision of F. I. McConnell who will continue in his capacity of development engineer in the new district organization.

W. C. Johnson to Represent Roebling in Southeast

John A. Roebling's Sons Co., through R. A. Hill, Houston branch manager, announces the appointment of W. C. "Bill" Johnson as its sales representative in the oil-field area comprising Louisiana, southern Arkansas, Mississippi, and points in Alabama and Florida.

W. C. JOHNSON

Stewart Again in South America For Hunt Tool Co.

G. M. Stewart, one of the oil-industry pioneers in export sales work in South America, left Houston recently for another extended tour of South American countries for Hunt Tool Co.

Stewart will represent the complete line of Hunt products as well as those of various other manufacturers handled by Hunt. He will be in South America about 3 months and will make trips to Peru, Ecuador, Colombia, Trinidad, and Venezuela.

Hunt Export Co. also is represented in the Argentine by A. P. Bolland, and in Mexico and Central America by W. Y. De Mouche.

De los Rios Joins Luscombe

Alfredo de los Rios, long identified with private flying throughout the Western Hemisphere, has been appointed manager of Latin-American sales of Luscombe Airplane Corp., L. H. P. Klotz, president, has announced. Before joining Luscombe, de los Rios was in the export division of Fairchild Engine & Airplane Co. in charge of sales of personal planes.

Allis-Chalmers Tractor Engineer to Lead Automotive Society in 1947

C. E. FRUDDEN

C. E. Frudden, consulting engineer of Allis-Chalmers Manufacturing Co., tractor division, became the sole nominee for the 1947 national presidency of Society of Automotive Engineers, according to G. W. Curtis, general chairman of the society's eleventh annual tractor meeting recently concluded in Milwaukee. The nomination is tantamount to election. Frudden will be the first Wisconsin man and the first tractor man elected to the presidency of the 40-year-old society. He will take office at the end of January.

Homco Announces Personnel Changes

The Houston Oil Field Material Co., Inc., announces A. J. Adams' return after approximately 4 years' absence. While on leave Adams served in the armed forces as a first lieutenant. Since his return he has been appointed assistant personnel director in Houston.

Roy W. Bythewood and O. C. Johnson have been employed as warehousemen in the sales department at Beaumont, Tex., and Mamou, La., respectively.

Thomas H. Cox is employed as mud engineer in the mud and chemical department at Houston. R. E. Lunday has returned after an absence of approximately 2 years, and is employed as a salesman in the Houston area. B. D. Burts and C. M. Standridge have recently joined the company as directional-drilling engineers. They will work in the New Iberia, La., district. W. G. Seis and L. J. Lawrence, formerly salesmen at Victoria, have been transferred to Houston and Corpus Christi, respectively.

Lawrence A. Babin has recently been promoted from warehouseman to salesman at New Iberia. Jack Stone, mud engineer, has been transferred from Eunice, N. M., to the store at Odessa, Tex. Tom C. Flowers has been promoted from maintenance man at Victoria to fishing-tool operator at Houston. W. O. Smith, formerly clerk in the Houston industrial sales department, has been promoted to salesman in that department. Reed Elliott has been transferred as warehouseman from Beaumont to Mamou, La. Jack O'Neal Massey has been promoted from warehouseman to field salesman at Raymondville, Tex.

Gray Buys American Iron & Machine Stock

Purchase of all capital stock of American Iron & Machine Works Co. by J. A. Gray, independent oil operator of Houston, was announced last week by Earl W. Miller, vice president and general manager of the company. Consideration was reported at about $3,000,000.

The company, a new major manufacturer of oil-field equipment in the Southwest, was organized in 1923. No changes in company personnel are planned.

Homco Buys Common Stock Of Briggs-Weaver

George O'Leary, president of Houston Oil Field Material Co., Inc., announced last week in Houston that all common stock of Briggs-Weaver Machinery Co., Dallas, has been acquired by his company. Stockholders were to pass on the purchase at a meeting this week.

OWEN

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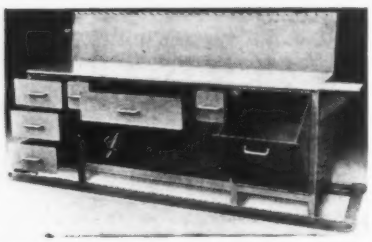

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